

RoHS Compliant

Serial ATA Flash Drive

Specifications for AS203

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Features:

- **Standard Serial ATA 2.6 (Gen. 2)**
 - Serial ATA 2.6 (Gen. 2)
 - SATA II, 3.0 Gbps
 - ATA-compatible command set
- **Capacities**
 - 32, 64, 128, 256 GB
- **Performance***
 - Sustained read: up to 250 MB/sec
 - Sustained write: up to 220 MB/sec
- **Intelligent endurance design**
 - Built-in ECC, enabling 48 bit correction per 2KB page
 - Superior wear-leveling scheme together with dynamical block allocation to significantly increase the lifetime of a flash device and optimize the disk performance
 - Flash bad-block management
 - S.M.A.R.T
 - TRIM
- **Zero power data retention**
 - No battery required for data storage
- **Temperature ranges**
 - Operation: 0°C to 70°C
 - Storage: -40°C to 85°C
- **Supply voltage**
 - 5.0 V \pm 5%
- **Power consumption****
 - Active mode: 1030 mA (Max)
 - Idle mode: 40 mA
- **Form factor**
 - 2.5 inch
- **Connector**
 - 7-pin SATA male connector
 - 15-pin SATA power connector
- **RoHS compliant**

*Vary with flash configurations.

**Based on 128 GB model

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1. Product Description

1.1 Introduction

Apacer's Serial ATA Flash Drive AS203 is a solid-state disk (SSD) drive that contains a controller, embedded firmware, and flash media along with a male connector. Using NAND flash memory devices, AS203 drive interfaces with the host allowing data to be seamlessly transferred between the host and the flash devices.

AS203 is designed with a single-chip controller, offering capacities of up to 256 gigabytes and providing full support for the SATA II high-speed interface standard. It can operate at sustained access rates of up to 250 megabytes per second.

In addition to buffer management through dynamical allocation, AS203 adopts the Apacer-specific superior wear-leveling scheme to allow uniform use of all storage blocks, ensuring that the lifetime of a flash media can be significantly increased and the disk performance is optimized as well.

1.2 Functional Block Diagram

AS203 drive includes a single-chip SATA II Controller and the flash media, as well as the SATA standard interface. The controller integrates the flash management unit with the controller itself to support multi-channel, multi-bank flash arrays. Figure 1-1 shows the functional block diagram.

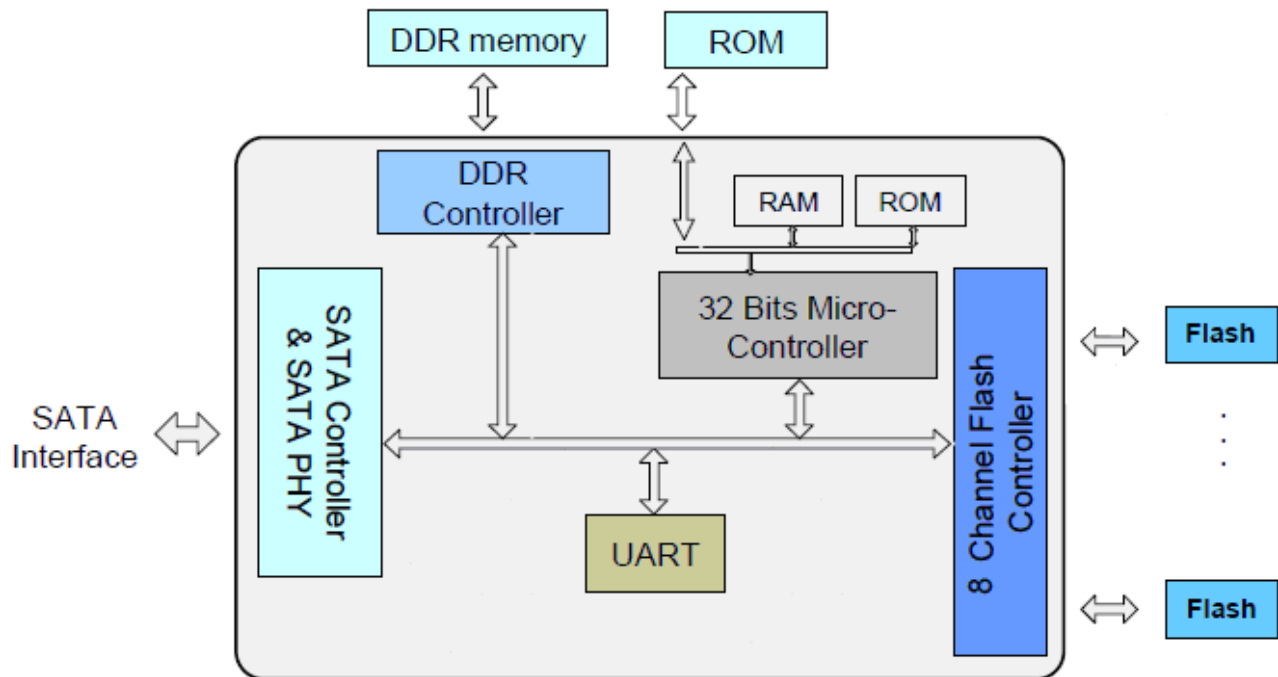


Figure 1-1 Apacer AS203 block diagram

1.3 ATA Mode Support

AS203 provides ATA mode support as follows:

- Up to PIO mode-4
- Up to Multiword DMA mode-2
- Up to UDMA mode-6

1.4 Capacity Specification

Capacity specification of the Apacer SSD product family is available as shown in Table 1-1. It lists the specific capacity, the default numbers of logical cylinders and heads, and the number of logical sectors per track for each product line.

Table 1-1 Capacity specification

Capacity	Total Bytes	Cylinders	Heads	Sectors	Max LBA*
32 GB	32,017,047,552	16383	16	63	62,533,296
64 GB	64,023,257,088	16383	16	63	125,045,424
128 GB	128,035,676,160	16383	16	63	250,069,680
256 GB	256,060,514,304	16383	16	63	500,118,192

*Cylinders, heads or sectors are not applicable for these capacities. Only LBA addressing applies.

1.5 Performance

Performance of AS203 in each capacity is shown in Table 1-2.

Table 1-2 Performance specification

Capacity Performance	32 GB	64 GB	128 GB	256 GB
Sustained Read (MB/s)	200	230	250	250
Sustained Write (MB/s)	100	180	220	220

Note: Performances vary from flash configurations;

1.6 Pin Assignments

Table 1-3 describes AS203 signal segment, and Table 1-4, its power segment.

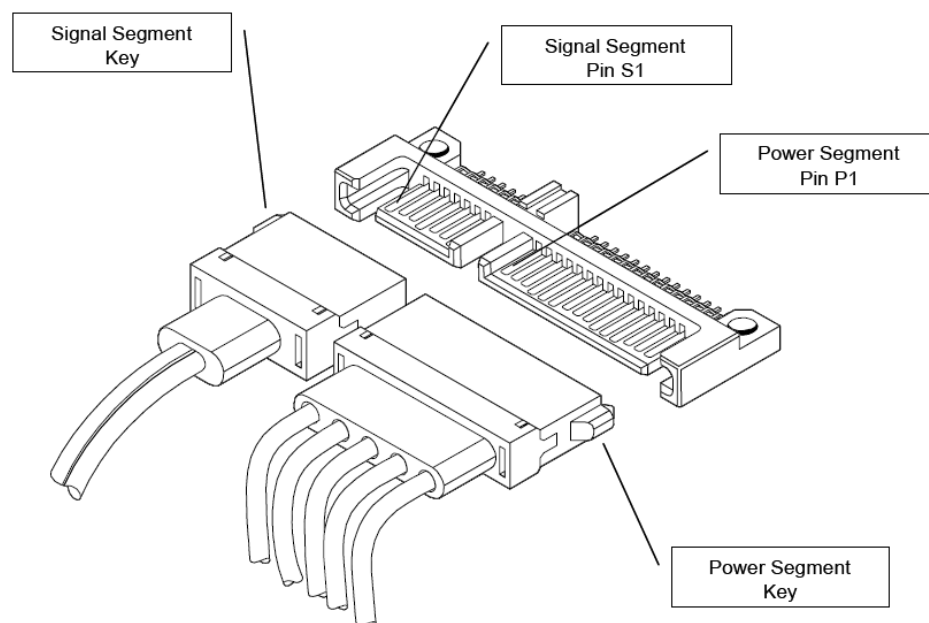


Figure 1-2 SATA Connectors

Table 1-3: Signal segment

Name	Type	Description
S1	GND	
S2	RxP	Serial Data Receiver
S3	RxN	
S4	GND	
S5	TxN	Serial Data Transmitter
S6	TxP	
S7	GND	

Table 1-4: Power segment

Pin	Signal/Description
P1	Not used (3.3V)
P2	Not used (3.3V)
P3	Not used (3.3V)
P4	Ground
P5	Ground
P6	Ground
P7	5V Pre-Charge
P8	5V
P9	5V
P10	Ground
P11	Reserved
P12	Ground
P13	Not used (12V Pre-Charge)
P14	Not used (12V)
P15	Not used (12V)

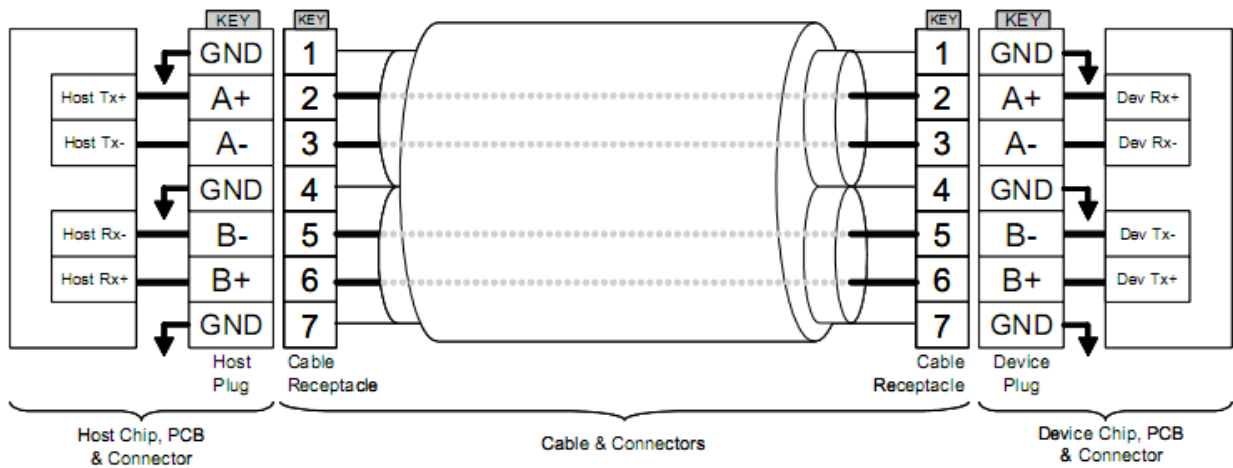


Figure 1-3 SATA Cable / Connector Connection Diagram

The connector on the left represents the Host with TX/RX differential pairs connected to a cable while the connector on the right shows the Device with TX/RX differential pairs also connected to the cable. Notice also the ground path connecting the shielding of the cable to the Cable Receptacle.

2. Flash Management

2.1 Error Correction/Detection

AS203 implements a hardware ECC scheme, based on the algorithm, to achieve 48 bit correction per 2KB page.

2.2 Bad Block Management

Although bad blocks on the flash media are already identified by the flash manufacturer, they can also be accumulated over time during operation AS203's controller maintains a table that lists those normal blocks with disk data, the free blocks for wear leveling, and bad blocks with errors. When a normal block is detected broken, it is replaced with a free block and listed as a bad block. When a free block is detected broken, it is then removed from the free block list and marked as a bad block.

During device operation, this ensures that newly accumulated bad blocks are transparent to the host. The device will stop file write service once there are only two free blocks left such that the read function is still available for copying the files from the disk into another.

2.3 Wear Leveling

The NAND flash devices are limited by a certain number of write cycles. When using a FAT-based file system, frequent FAT table updates are required. If some area on the flash wears out faster than others, it would significantly reduce the lifetime of the whole SSD, even if the erase counts of others are far from the write cycle limit. Thus, if the write cycles can be distributed evenly across the media, the lifetime of the media can be prolonged significantly. This scheme is called wear leveling.

Apacer's wear-leveling scheme is achieved both via buffer management and Apacer-specific superior wear leveling to ensure the lifetime of the flash media can be increased and the disk access performance is optimized as well.

2.4 S.M.A.R.T.

S.M.A.R.T. is an acronym for Self-Monitoring, Analysis and Reporting Technology, an open standard allowing disk drives to automatically monitor their own health and report potential problems. It protects the user from unscheduled downtime by monitoring and storing critical drive performance and calibration parameters. Ideally, this should allow taking proactive actions to prevent impending drive failure.

Apacer AS203 uses the standard SMART command B0h to read data from the drive for SMART feature as the SATA Rev.2.6 ATA/ATAPI-7 specifications are based on the SFF-8035i Rev. 2.0 specifications.

2.5 TRIM

Made of millions of NAND flash cells, SSD can be written into groups called pages in 4K size generally, but can only be erased in larger groups called blocks of 128 pages or 512KB. These stipulations are partially the source of many performance issues. Until an address gets used again, the SSD has to keep track of every last bit of data that's written on it. The ATA-TRIM instruction tilts the balance in favor of the SSD. TRIM addresses a major part of the performance degradation issue over time that plagues all SSDs. A TRIM enabled drive running an OS with TRIM support will stay closer to its peak performance over time.

3. Environmental Specifications

3.1 Environments

Table 3-1 AS203 environmental specifications

Environment	Specification
Temperature	0°C to 70°C (Operating)
	-40°C to 85°C (Storage)
Humidity	95% under 55°C
Vibration	20G/80-2000Hz
Shock	1500G/0.5ms

3.2 Mean Time Between Failures (MTBF)

Mean Time Between Failures (MTBF) is predicted based on reliability data for the individual components in the SAFD drive. Although many component MTBFs are given in databases and often these values are not really accurate, the prediction result for AS203 is more than 1,000,000 hours.

3.3 Certification and Compliance

AS203 drive complies with the following standards:

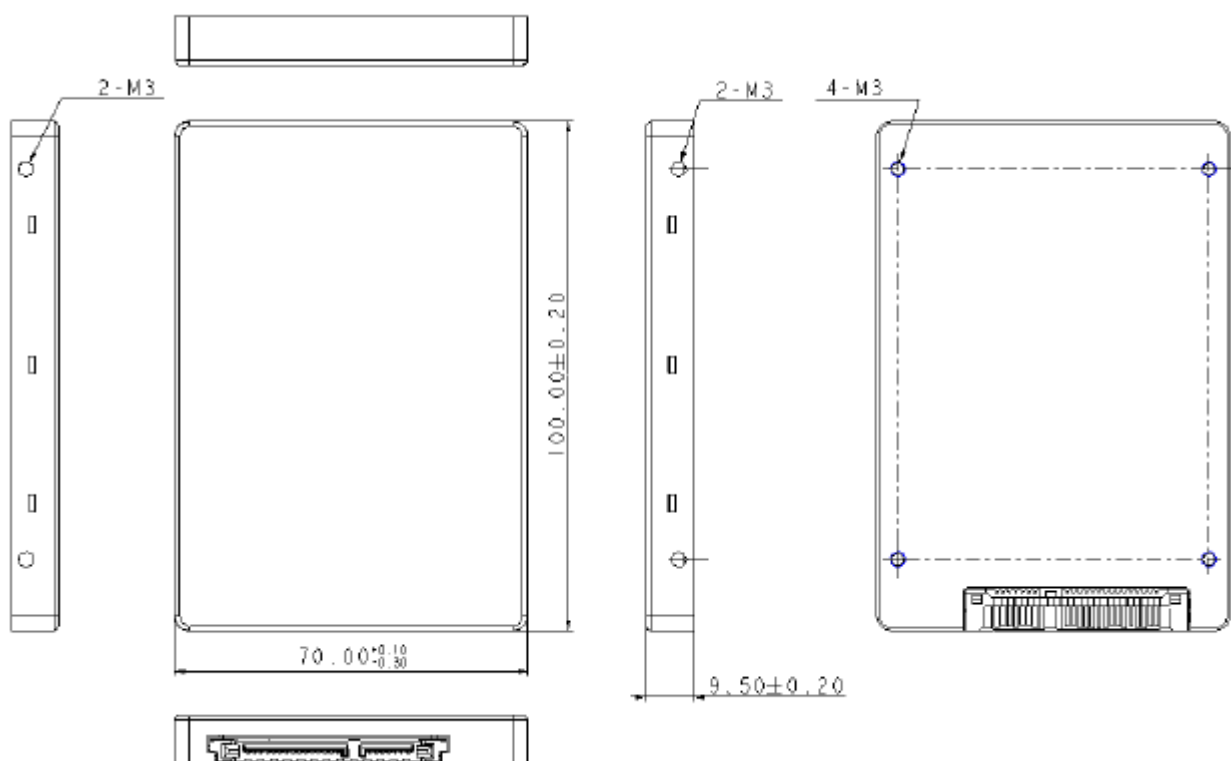
- CE
- FCC
- RoHS
- SATA II (SATA Rev. 2.6)

4. Physical Characteristics

Figure 4-1 illustrates the overall dimensions of AS203 drive, as listed in Table 4-1.

Table 4-1 SAFD dimensions

Dimension	Millimeters (mm)
Height	9.50 ± 0.20
Width	69.90 ± 0.15
Length	100.00 ± 0.20



Unit: mm

Figure 4-1 AS203 physical dimensions

5. Product Ordering Information

32 GB	AP32GAS203
	AP32GAS203-1
	AP32GAS203-5
64 GB	AP64GAS203
	AP64GAS203-1
	AP64GAS203-5
128 GB	AP128GAS203
	AP128GAS203-1
	AP128GAS203-5
256 GB	AP256GAS203
	AP256GAS203-1
	AP256GAS203-5

Note: Valid combinations are those products in mass production or will be in mass production. Consult your Apacer sales representative to confirm availability of valid combinations and to determine availability of new combinations.

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