

BS203

Product Specification

- Support SATA interface rate of 6 Gb/s
- Ultra high-performance and low power consumption
- Support dynamic power management and SMART
- TRIM command supported

Revision History

Version	Date	Description
1.0	May 2021	Initial release
2.0	May 2021	Performance data updated
2.1	Jun 2021	Add TBW
3.0	Jul 2021	Version Update

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Although considered final, these specifications are subject to change, as further product development and data characterization some-times occur. The results obtained in other operating environments may vary.

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1. Introduction

1.1 Overview

This document describes the specifications and capabilities of the BIWIN Solid-State Drive (SSD) BS203 Series specific to the M.2 Form Factor.

The BS203 Series delivers compact storage and optimized performance for traditional and innovative small-form-factor and embedded platforms in two capacity sizes: 128GB and 256GB.

This BS203 Series SSD product electrically complies with the SATA-III standards and is electrically compatible with a serial ATA disk drive. In order to meet the high quality, BS203 SSD utilizes high performance SATA-III SSD controller and 3D TLC NAND Flash Memory. Moreover, to ensure the data integrity, many advanced technologies are used such as dynamic bad block management, dynamic and static wear-leveling, and error correction code (ECC).

The BS203 Series SSD drastically out performs conventional Hard Disk Drives. In addition, BS203 Series could also enable the realization of high capacity and highly reliable SSDs on the market.

1.2 Product Information

Model Name	Part Number	Capacity	DRAM(DDR3L)
BS203	CNF80V41K01-128	128GB	256MB
	CNF80V41K01-256	256GB	256MB

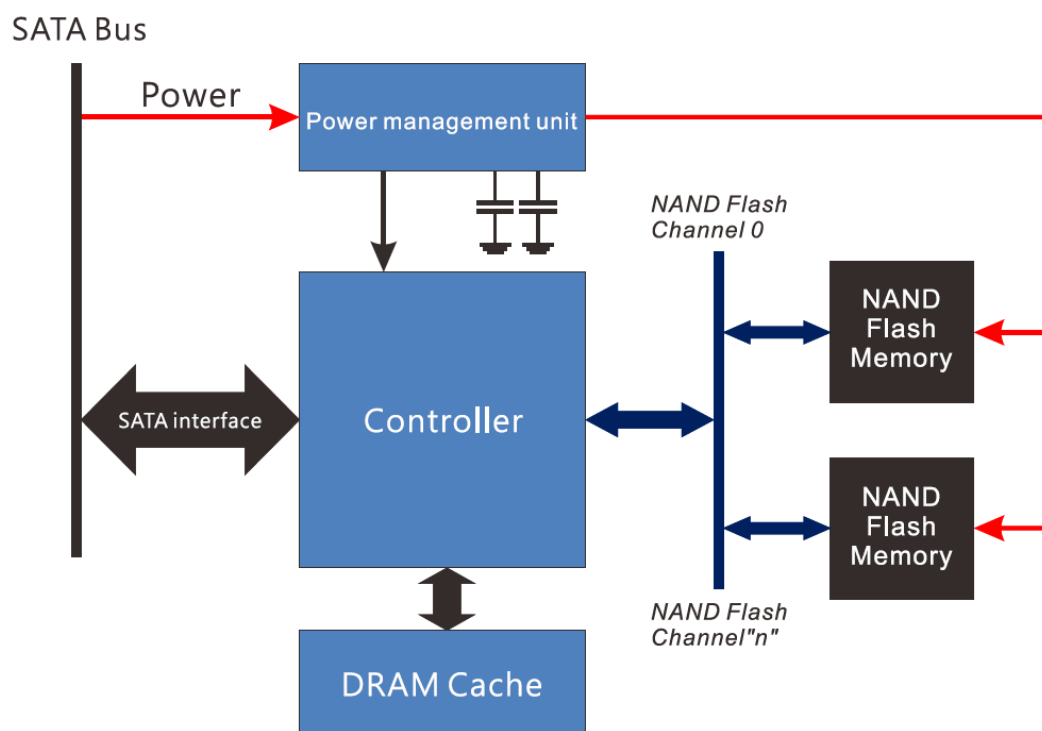
1.3 Features

- High performance
- Low power consumption
- Increased system responsiveness
- High reliability
- Dynamic and static wear-leveling
- Garbage collection & TRIM
- Enhanced ruggedness
- High data integrity and security

2. Architecture

The BIWIN SSD BS203 SSD Series utilizes a cost-effective, high-performance BIWIN SATA-to-NAND controller to manage a full SATA 6 Gb/s bandwidth with the host while managing multiple NAND flash memory devices on 4 channels.

Figure 3. Block Diagram



3. Product Specifications

This section provides details on the BIWIN SSD BS203 Series product specifications.

3.1 Capacity

Table 1. User Addressable Sectors

Unformatted Capacity	128GB	256GB
Total User Addressable Sectors in LBA Mode	250,069,680	500,118,192

Notes:

- 1GB = 1,000,000,000 bytes; 1 sector = 512 bytes.
- LBA count shown represents total user storage capacity and will remain the same throughout the life of the drive.
The total usable capacity of the SSD may be less than the total physical capacity because a small portion of the capacity issued for NAND flash management and maintenance purposes.

3.2 Performance

Performance ¹	128GB	256GB
Random Read/Write IOPS (Input/output Operations per Second) ²		
4K Read (Up to)	48K	81K
4K Write (Up to)	29K	59K
Maximum Sustained Read and Write Bandwidth (CDM) ²		
Sequential Read (Up to)	560MB/s	560MB/s
Sequential Write (Up to)	120MB/s	247MB/s
Latency (AS SSD) ³		
Read	0.047ms (TYP)	0.048ms (TYP)
Write	0.027ms (TYP)	0.031ms (TYP)

Notes:

1. Table for reference only. Performance may vary according to flash configuration and platform. The acceptable range is within 10%.
2. Performance measured using CDM tested with QD32 Thread.
3. Device measured using AS SSD; Read/Write latency measured on sequential 4 K transfers with queue depth set to 32. Write Cache Enabled.

3.3 Test Equipment

Equipment	Item	Equipment	Item
CPU	Intel i7-7700K 4.20G	Motherboard	ASUS Z270
Chipset	Intel Z270	Memory	BIWIN U-DIMM 2666MHz 8GB
Graphics Card	On Board VGA	OS SSD	BIWINTECH Phoenix2.5" 512GB
Power Supply	HuntKey ATX-500W	OS Version	Windows 10 X64

Notes: Capacity of 128GB and 256GB share the same test equipment.

3.4 Power Loss Protection Specifications

Figure 2. Functional Block Diagram

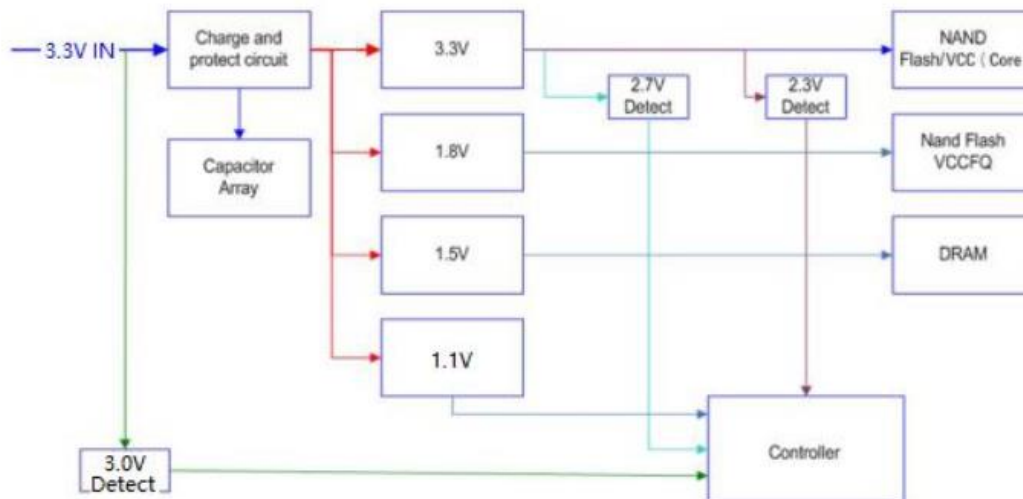
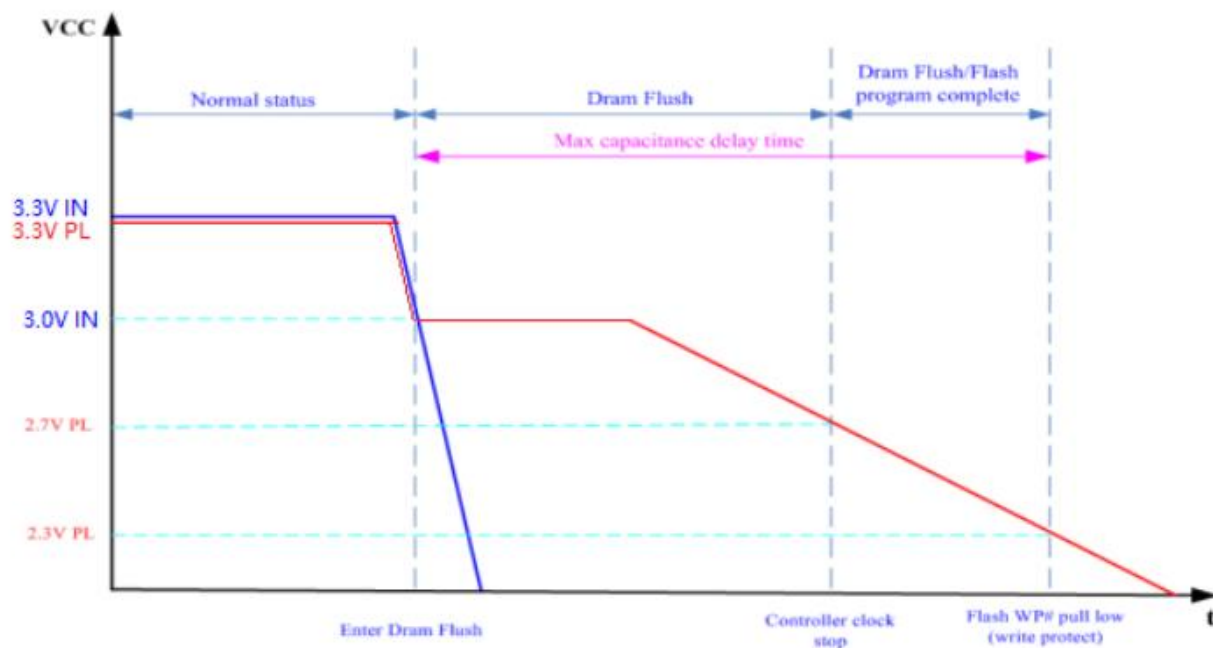


Figure 3. Power Loss Protection Process



3.5 Electrical

Table 2. Operating Voltage and Power Consumption

Electrical Characteristics	128GB	256GB
Operating Voltage for 3.3V (+/- 10%)		
Min	3.0V	
Max	3.6V	
Power Consumption (Typical)		
Active ¹ (Read)	1.21W	1.29W
Active ¹ (Write)	1.88W	2.37W
Idle ²	0.33W	0.35W

Note: 1. Power Consumption measured using KEITHLEY 2280S.

3.6 Environmental Conditions

Table 3. Temperature, Shock, Vibration

Parameter	Value
Ambient Temperature	
Operating	0 to 70 °C
Non-Operating	-40 to 85 °C
Temperature Gradient ¹	2 (Typical)°C/min
Humidity, Shock, Vibration	
Humidity	20-95% R.H.
Shock ²	100 G/6 sec.
Vibration ³	6.0667 GRMS (20-2000Hz)

Notes:

1. Under condition that SSD is mounted securely with the input shock, measured using FSY-50.
2. Under condition that SSD is mounted securely with the input vibration, measured using FT-100.

3.7 Reliability

Table 4. Reliability Specifications

Parameter	Value
Uncorrectable Bit Error Rate (UBER)	1 sector in 10 ¹⁶ bits read, max
Mean Time Between Failure (MTBF)	1,500,000 hours
Power On/Off Cycles	3000 cycles

Table 5. TBW and Warranty

Item		128GB	256GB
Warranty	TBW	187TBW	375TBW
	Period	3 years	

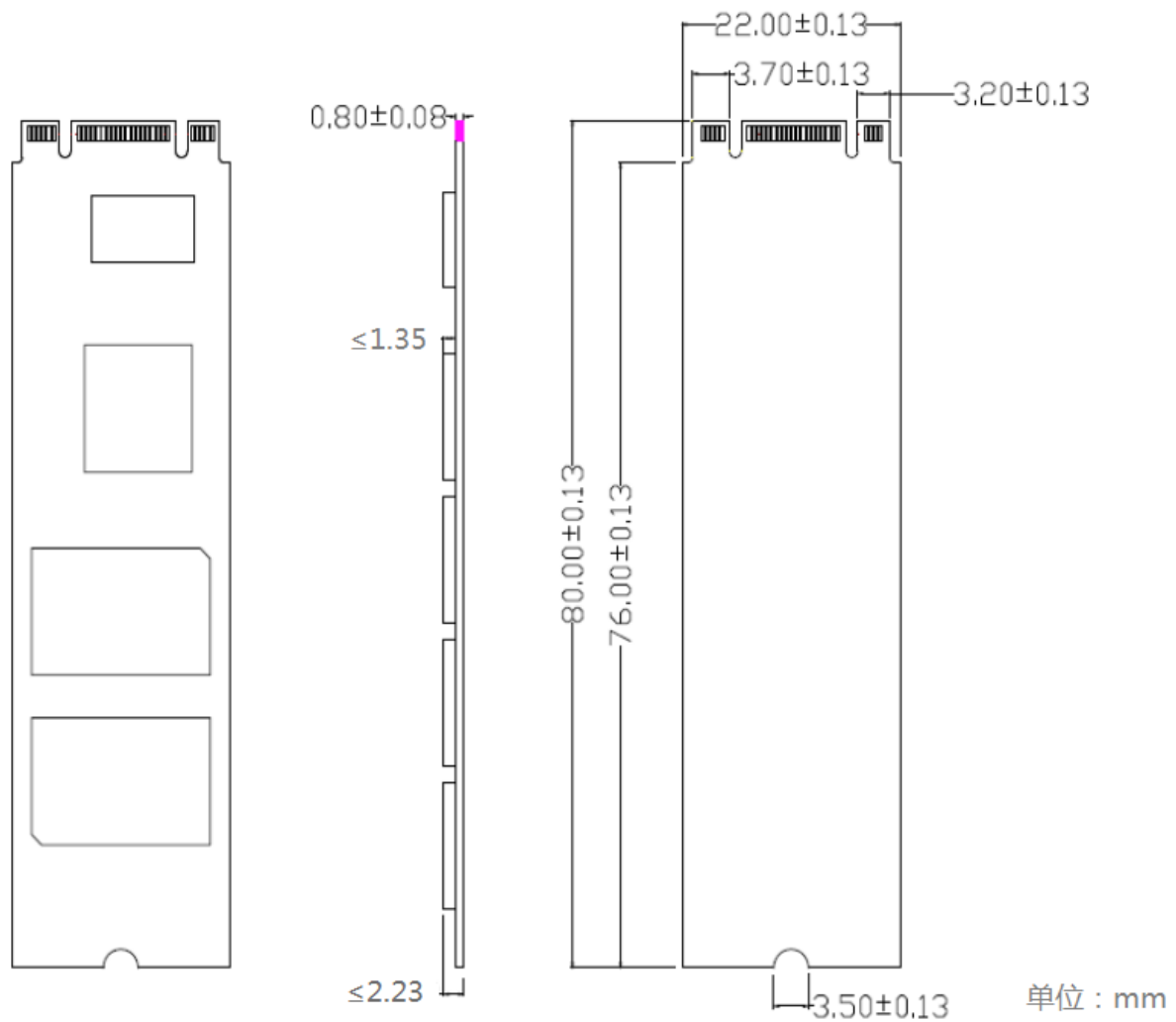
Note: *Total bytes written=[(Flash P/E cycle)x(number of bits in drive)] / WAF WAF=1.0

- WAF: Write Amplification Factor (WAF) is a numerical value representing the ratio between the amount of data that a SSD controller needs to write and the amount of data that the host's flash controller writes. A better WAF, which is near 1, guarantees better endurance and lower frequency of data written to flash memory.
- TBW may differ according to flash configuration and platform.
- The endurance of SSD could be estimated based on user behavior, NAND endurance cycles, and write amplification factor. It is not guaranteed by flash vendor.

4. Mechanical Information

Figure 4 shows the physical dimension of the BIWIN SSD BS203 Series. All dimensions are in millimeters.

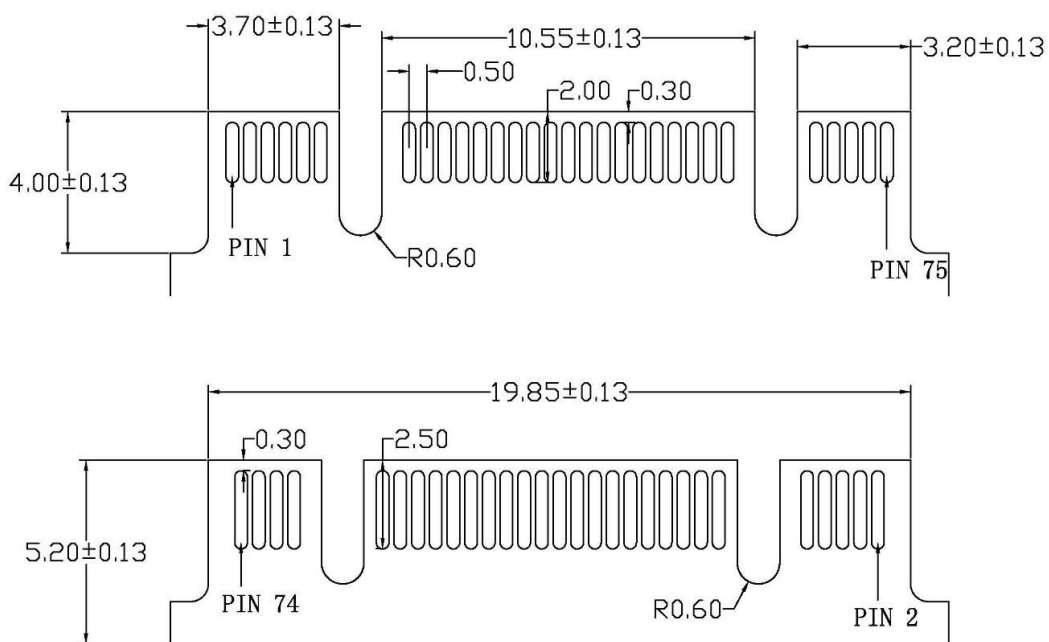
Figure 4. BIWIN SSD BS203 Dimensions



5. Pin and Signal Descriptions

5.1 Pin Locations

Figure 5. Signal and Power Segment Pins



5.2 Signal Descriptions

Table 6. Connector Pin Signal Definitions

Pin#	Assignment	Description
1	GND	CONFIG_3 = GND
2	3.3V	3.3V source
3	GND	Ground
4	3.3V	3.3V source
5	N/C	No connect
6	N/C	No connect
7	N/C	No connect
8	N/C	No connect
9	N/C	No connect
10	LED1#	Shows IO activity
11	N/C	No connect
12	Module Key B	Module Key
13	Module Key B	Module Key
14	Module Key B	Module Key
15	Module Key B	Module Key
16	Module Key B	Module Key
17	Module Key B	Module Key
18	Module Key B	Module Key
19	Module Key B	Module Key

20	N/C	No connect
21	GND	Ground
22	N/C	No connect
23	N/C	No connect
24	N/C	No connect
25	N/C	No connect
26	N/C	No connect
27	GND	Ground
28	N/C	No connect
29	N/C	No connect
30	N/C	No connect
31	N/C	No connect
32	N/C	No connect
33	GND	Ground
34	N/C	No connect
35	N/C	No connect
36	N/C	No connect
37	N/C	No connect
38	DEVSLEEP (I) (0/3.3V)	Device Sleep, input
39	GND	Ground
40	N/C	No connect
41	SATA-B+	Host transmitter differential signal pair

42	N/C	No connect
43	SATA-B-	Host transmitter differential signal pair
44	N/C	No connect
45	GND	Ground
46	N/C	No connect
47	SATA-A-	Host transmitter differential signal pair
48	N/C	No connect
49	SATA-A+	Host transmitter differential signal pair
50	N/C	No connect
51	GND	Ground
52	N/C	No connect
53	N/C	No connect
54	N/C	No connect
55	N/C	No connect
56	N/C	No connect
57	GND	Ground
58	N/C	No connect
59	Module Key M	Module Key
60	Module Key M	Module Key
61	Module Key M	Module Key
62	Module Key M	Module Key

63	Module Key M	Module Key
64	Module Key M	Module Key
65	Module Key M	Module Key
66	Module Key M	Module Key
67	N/C	No connect
68	SUSCLK (32KHz) (I)(0/3.3V)	32.768 kHz clock supply input that is provided by the platform chipset to reduce power and cost for the module.
69	GND	CONFIG_1 = Ground
70	3.3V	3.3V source
71	GND	Ground
72	3.3V	3.3V source
73	GND	Ground
74	3.3V	3.3V source
75	GND	CONFIG_2 = Ground

6. Supported Command Sets

The BIWIN SSD BS203 Series supports ATA (Advanced Technology Attachment) commands described in this section.

6.1 ATA General Feature Command Set

The BIWIN SSD BS203 Series supports the ATA General Feature command set (non-PACKET), which consists of:

- EXECUTE DEVICE DIAGNOSTIC
- FLUSH CACHE
- IDENTIFY DEVICE
- READ DMA
- READ SECTOR(S)
- READ VERIFY SECTOR(S)
- SEEK
- SET FEATURES
- WRITE DMA
- WRITE SECTOR(S)
- READ MULTIPLE
- SET MULTIPLE MODE
- WRITE MULTIPLE

The BIWIN SSD BS203 Series also supports the following optional commands:

- READ BUFFER
- WRITE BUFFER
- NOP
- DOWNLOAD MICROCODE

6.2 Power Management Command Set

The BIWIN SSD BS203 Series supports the Power Management command set, which consists of:

- CHECK POWER MODE
- IDLE
- IDLE IMMEDIATE
- STANDBY
- STANDBY IMMEDIATE

6.3 Security Mode Feature Set

The BIWIN SSD BS203 Series supports the Security Mode command set, which consists of:

- SECURITY SET PASSWORD
- SECURITY UNLOCK
- SECURITY ERASE PREPARE
- SECURITY ERASE UNIT
- SECURITY FREEZE LOCK
- SECURITY DISABLE PASSWORD

6.4 SMART Command Set

The BIWIN SSD BS203 Series supports the SMART command set, which consists of:

- SMART ENABLE OPERATIONS
- SMART DISABLE OPERATIONS
- SMART ENABLE/DISABLE AUTOSAVE
- SMART RETURN STATUS

The BIWIN SSD BS203 Series also supports the following optional commands:

- SMART EXECUTE OFF-LINE IMMEDIATE
- SMART READ DATA
- SMART READ LOG
- SMART WRITE LOG

6.5 Data Set Management Command Set

The BIWIN SSD BS203 Series supports the Data Set Management command set Trim attribute, which consists of:

- DATA SET MANAGEMENT EXT

6.6 Host Protected Area Command Set

The BIWIN SSD BS203 Series supports the Host Protected Area command set, which consists of:

- READ NATIVE MAX ADDRESS
- SET MAX ADDRESS
- READ NATIVE MAX ADDRESS EXT
- SET MAX ADDRESS EXT

The BIWIN SSD BS203 Series also supports the following optional commands:

- SET MAX SET PASSWORD
- SET MAX LOCK
- SET MAX FREEZE LOCK
- SET MAX UNLOCK

6.7 48-Bit Address Command Set

The BIWIN SSD BS203 Series supports the 48-bit Address command set, which consists of:

- FLUSH CACHE EXT
- READ DMA EXT
- READ NATIVE MAX ADDRESS EXT
- READ SECTOR(S) EXT
- READ VERIFY SECTOR(S) EXT
- SET MAX ADDRESS EXT
- WRITE DMA EXT
- WRITE MULTIPLE EXT
- WRITE SECTOR(S) EXT
- WRITE UNCORRECTABLE EXT

6.8 Device Configuration Overlay Command Set

The BIWIN SSD BS203 Series supports the Device Configuration Overlay command set, which consists of:

- DEVICE CONFIGURATION FREEZE LOCK
- DEVICE CONFIGURATION IDENTITY
- DEVICE CONFIGURATION RESTORE
- DEVICE CONFIGURATION SET

6.9 General Purpose Log Command Set

The BIWIN SSD BS203 Series supports the General-Purpose Log command set, which consists of:

- READ LOG EXT
- WRITE LOG EXT

6.10 Native Command Queuing

The BIWIN SSD BS203 Series supports the Native Command Queuing (NCQ) command set, which includes:

- READ FPDMA QUEUED
- WRITE FPDMA QUEUED

Note: With a maximum queue depth equal to 32.

6.11 Software Settings Preservation

The BIWIN SSD BS203 Series supports the SET FEATURES parameter to enable/disable the preservation of software settings.

6.12 Device Initiated Power Management (DIPM)

The BIWIN SSD BS203 Series supports the SET FEATURES parameter to enable Device Initiated Power Management.

7. Certifications and Declarations

Certification	Description
CE Compliant	Indicates conformity with the essential health and safety requirements set out in European Directives Low Voltage Directive and EMC Directive.
RoHS Compliant	Restriction of Hazardous Substance Directive.