

BS201

Product Specification

- Consistent performance
- Power loss protection
- Vibration resistance
- Over-voltage & Over-current protection
- With DRAM Cache

Revision History

Version	Date	Description
1.0	April. 2021	Initial Release
2.0	May. 2021	Version Update
3.0	Jul. 2021	Version Update
4.0	Dec. 2021	TBW Update

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1. Introduction

1.1 Overview

This document describes the specifications and capabilities of the BIWIN Solid-State Drive (SSD) BS201 Series specific to the 2.5-inch Form Factor.

The 2.5-inch BS201 Series SSD of BIWIN fully consists of semiconductor devices using 3D NAND Flash Memory which provide high reliability and high performance for a storage media. This BS201 Series product is perfect for the computer enthusiasts who want to improve the system performance in the easiest way.

The 2.5-inch BS201 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, 2.5-inch BS201 SSD utilizes high performance SATA-III SSD controller and 3D 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). In addition, this 2.5-inch BS201 Series could also provide rugged features in industrial PC under an extreme environment with a high MTBF.

1.2 Product Information

Model Name	Part Number	Capacity	DRAM(DDR3L)
BS201	CSE25GS2578-128	128GB	256MB
	CSE25GS2578-256	256GB	256MB
	CSE25GS2578-512	512GB	512MB

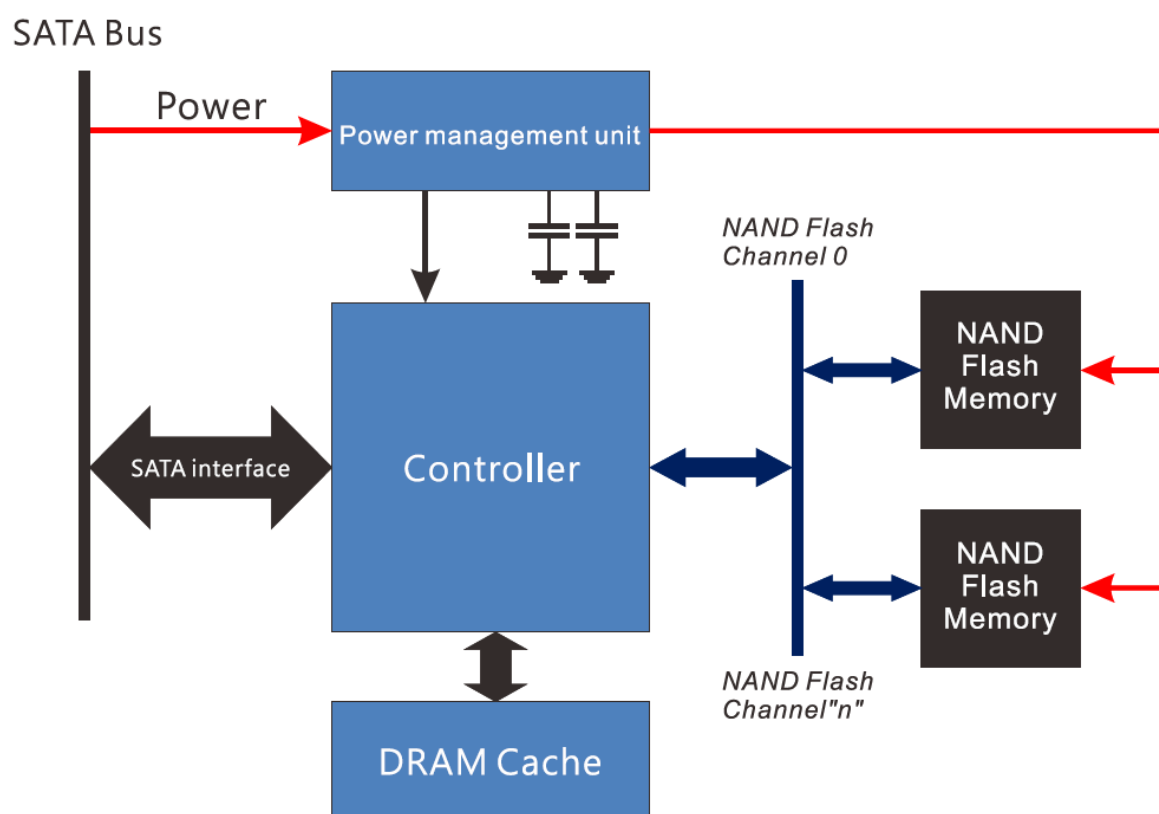
1.3 Features

- Consistent performance
- Power loss protection
- Vibration resistance
- Over-voltage & Over-current protection
- Dynamic and static wear-leveling
- Garbage collection & TRIM
- High data integrity and security
- DRAM cache: DDR3L

2. Architecture

The BIWIN 2.5-inch BS201 SSD Series utilizes a 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 1. Block Diagram



3. Product Specifications

This section provides details on the BIWIN SSD 2.5-inch BS201 Series product specifications.

3.1 Capacity

Table 1. User Addressable Sectors

Unformatted Capacity ¹	128GB	256GB	512GB
Total User Addressable Sectors in LBA Mode	250,069,680	500,118,192	1,000,215,216

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 is used for NAND flash management and maintenance purposes.

3.2 Performance

Performance	128GB	256GB	512GB
Random Read/Write IOPS (Input/Output Operations per Second) (CDM)			
4K Read (Up to)	48K	82K	97K
4K Write (Up to)	29K	59K	83K
Maximum Sustained Read and Write Bandwidth (CDM)			
Sequential Read (Up to)	563MB/s	561MB/s	563MB/s
Sequential Write (Up to)	122MB/s	243MB/s	483MB/s
Latency (AS SSD)			
Read	0.043ms	0.037ms	0.041ms
Write	0.060ms	0.044ms	0.039ms

Notes:

1. Table for reference only. Performance may vary according to flash configuration and platform. The acceptable range is within 10%.
2. Sequential Read/Write, 4K Random Read/Write measured using CrystalDiskMark (CDM)V8.0;
3. Read/Write Latency measured using AS SSD Benchmark V2.0.

3.3 Test Equipment

Equipment	Item	Equipment	Item
CPU	Intel i9-10900K	Motherboard	ROG STRIX Z490-A
Chipset	Intel Z490	Memory	BIWIN DDR4 2666MHz 16G
Graphics Card	On Board VGA	OS SSD	BIWINTech Phoenix SSD 512GB
Power Supply	HuntKey ATX-500W	OS Version	Windows 10 X64

Notes: Capacity of 128GB, 256GB and 512GB share the same test equipment.

3.4 Power Loss Protection Specifications

Figure 2. Functional Block Diagram

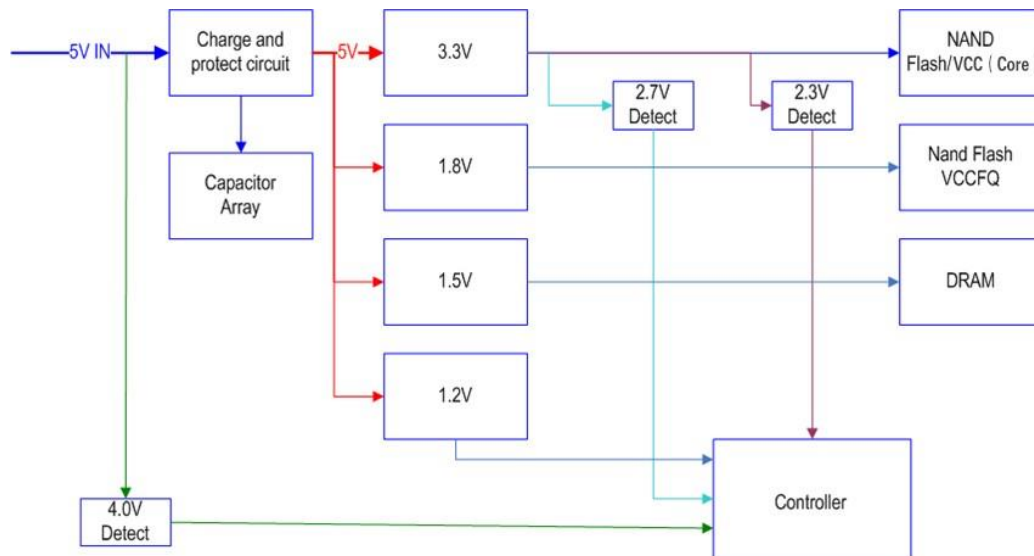
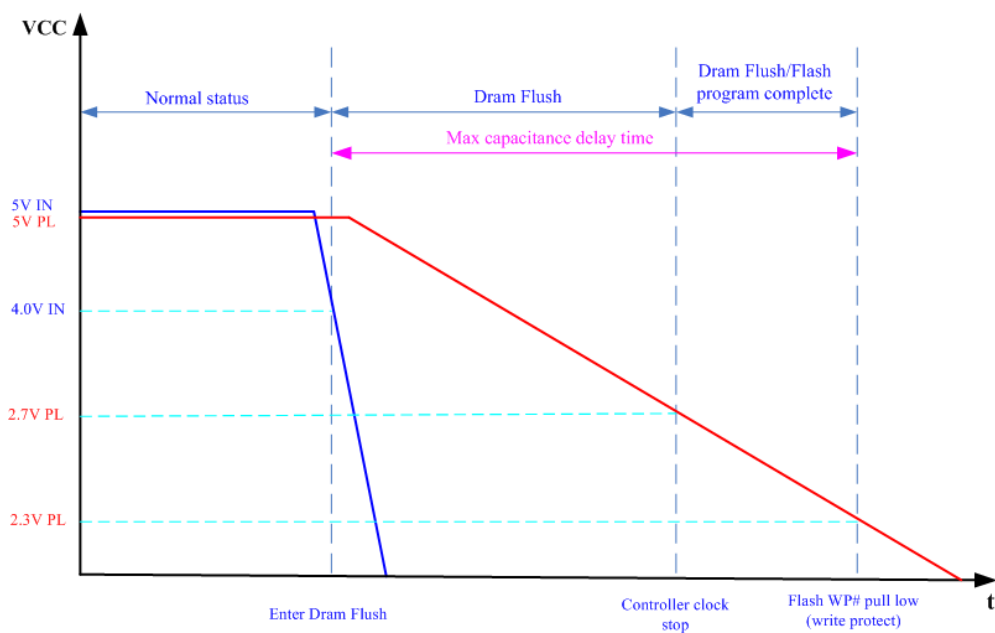


Figure 3. Power Loss Protection Process



3.5 Electrical

Table 2. Operating Voltage and Power Consumption

Electrical Characteristics	128GB	256GB	512GB
Operating Voltage for 5V (+/- 10%)			
MIN	4.5V		
MAX	5.5V		
Power Consumption (Typical)			
Active (Read)	1.53W	1.53W	1.76W
Active (Write)	2.20W	2.63W	3.48W
Idle	0.52W	0.50W	0.43W

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
Humidity, Shock, Vibration	
Humidity	20-95% R.H.
Shock ¹	1500G/0.5ms
Vibration ²	6.0667 GRMS (20-2000Hz)

Notes:

1. Under condition that SSD is mounted securely with the input vibration, 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

Table 5. Reliability Specifications

Item		128GB	256GB	512GB
Warranty	TBW	47TB	94TB	187TB
	Period	3 years		

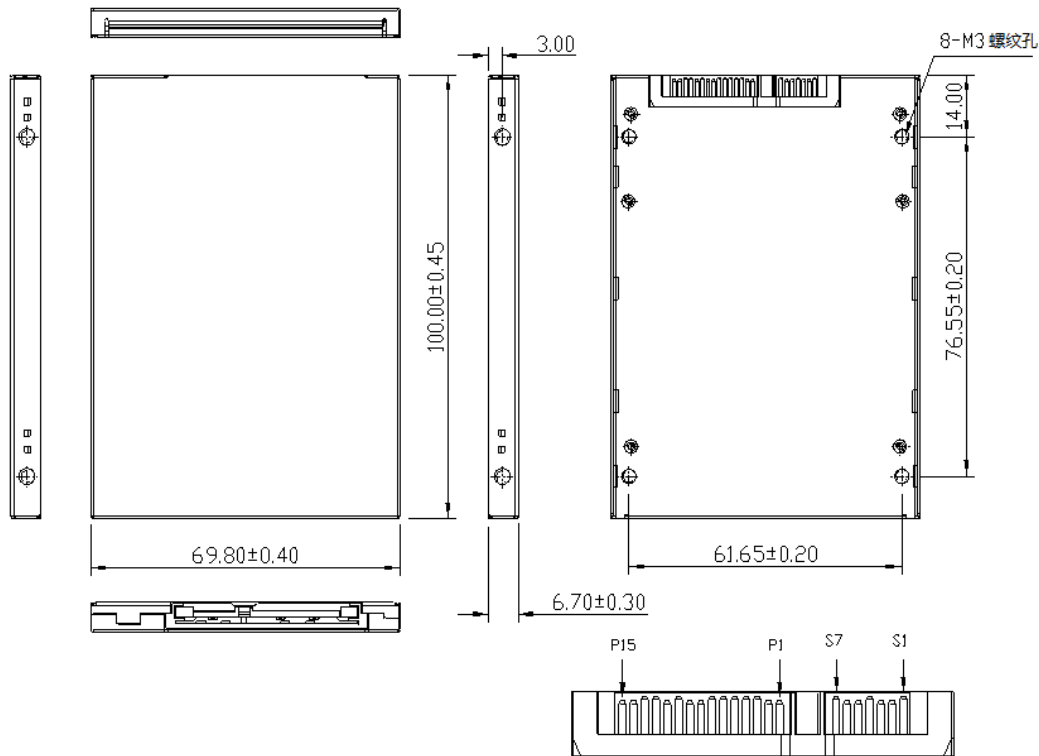
Note: *Total bytes written=[(Flash P/E cycle)x(number of bits in drive)] / WAF

WAF=4.0

4. Mechanical Information

Figure 4 shows the physical dimension of the BIWIN SSD 2.5-inch BS201 Series. All dimensions are in millimeters.

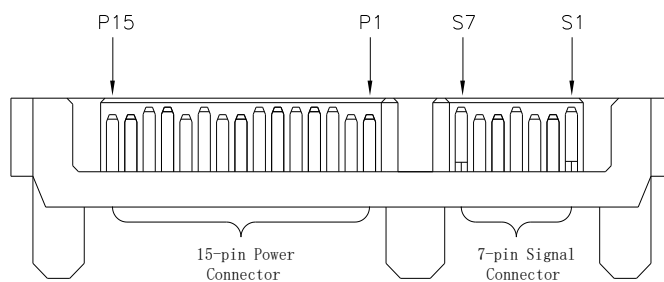
Figure4. BIWIN SSD 2.5-inch BS201 Dimensions



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
Signal		
S1	GND	2 nd mate
S2	A+	Differential signal pair A from physical layer electronics
S3	A-	
S4	GND	2 nd mate
S5	B-	Differential signal pair B from physical layer electronics
S6	B+	
S7	GND	2 nd mate
Power		
P1	V33	3.3V power (Not used)
P2	V33	3.3V power (Not used)
P3	V33	3.3V power (Not used)
P4	GND	1 st mate
P5	GND	2 nd mate
P6	GND	2 nd mate
P7	V5	5V power, pre-charge, 2 nd mate
P8	V5	5V power
P9	V5	5V power

Pin#	Assignment	Description
P10	GND	2 nd mate
P11	DAS/DSS	DAS (Option)
P12	GND	2 nd mate
P13	V12	12V power, pre-charge, 2 nd mate (Not used)
P14	V12	12V power (Not used)
P15	V12	12V power (Not used)

6. Supported Command Sets

The BIWIN SSD 2.5-inch BS201 Series supports ATA (Advanced Technology Attachment) commands described in this section.

6.1 ATA General Feature Command Set

The BIWIN SSD 2.5-inch BS201 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 2.5-inch BS201 Series also supports the following optional commands:

- READ BUFFER
- WRITE BUFFER
- NOP
- DOWNLOAD MICROCODE

6.2 Power Management Command Set

The BIWIN SSD 2.5-inch BS201 Series supports the Power Management command set, which consists of:

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

6.3 Security Mode Feature Set

The BIWIN SSD 2.5-inch BS201 Series supports the Security Mode command set, which consists of:

- SECURITY SET PASSWORD

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

6.4 SMART Command Set

The BIWIN SSD 2.5-inch BS201 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 2.5-inch BS201 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 2.5-inch BS201 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 2.5-inch BS201 Series supports the Host Protected Area command set, which consists of:

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

The BIWIN SSD 2.5-inch BS201 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 2.5-inch BS201 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 General Purpose Log Command Set

The BIWIN SSD 2.5-inch BS201 Series supports the General Purpose Log command set, which consists of:

- READ LOG EXT
- WRITE LOG EXT

6.9 Native Command Queuing

The BIWIN SSD 2.5-inch BS201 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.

6.10 Software Settings Preservation

The BIWIN SSD 2.5-inch BS201 Series supports the SET FEATURES parameter to enable/disable the preservation of software settings.

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.