

Product Features

- Density:4GB, 8GB,16GB,32GB,64GB,128GB
- Form factor: 2.5" Type
- Interface standard: Serial ATA Revision 2.6
- Input voltage: $+5V (\pm 5\%)$
- Flash management algorithm: static and dynamic wear-leveling, bad block management algorithm
- Supports dynamic power management and SMART (Self-Monitoring, Analysis and Reporting Technology), NCQ;
- ECC (Error Correction Code): 16 or 24bits correctable per 1024-byte sector (BCH)
- Read endurance: unlimited
- Data retention: 10 years
- MTBF:2,000,000 Hours
- Performance External Transfer Rate (Host Transfer Rate):300MB/s
 - Data Read/Write (ATTO):

-4GB: up to 43/36 MB/S (SLC)

-8GB: up to 83/70 MB/S (SLC)

- -16GB: up to 164/143 MB/S (SLC)
- -32GB: up to 164/143 MB/S (SLC)
- -64GB: up to 162/157 MB/S (SLC)
- -128GB: up to 163/157 MB/S (SLC)



Ordering Information

Model Name	Part Number	Capacity	Flash Type
15201	ISA25SA2010-004	4GB	SLC
I5201	ISA25SA2010-008	8GB	SLC
15201	ISA25SA2010-016	16GB	SLC
15201	ISA25SA2010-032	32GB	SLC
15201	ISA25SA2010-064	64GB	SLC
15201	ISA25SA2010-128	128GB	SLC

Revision History

Version	Data	Description
V1.0	2013-1-7	-Initial draft
V1.1	2013-4-25	-Add 128GB Product information



Table of Contents

1. Overview	4 -
2. Block Diagram	
3. Mechanical Information	5 -
3.1 Physical Specifications	5 -
3.2 Interface Description	5 -
3.3 Pin Assignments	6 -
4. Reliability Specification	7 -
Wear-leveling	7 -
5. Electrical Specification	8 -
5.1 SATA Typical Power Consumption	8 -
5.2 Absolute Maximum Rating	8 -
5.3 Shock and Vibration	8 -
6. Command Descriptions	9 -



1. Overview

The Industrial Series SSD (solid state Drive) of BIWIN fully consists of semiconductor devices using NAND Flash Memory which provide high reliability and high performance for a storage media at a competitive price. Due to the nature of SSD, there are no mechanical moving parts which made the device faster, cooler, quieter. Therefore, SSD provides a better solution to replace the traditional Hard Disk Drives from different aspects such as power consumption, sequential and random read performance as well as sequential and random write performance.

The Industrial Series SSD product electrically complies with the SATA-II standards and is electrically compatible with a serial ATA disk drive. In order to meet the high requirements for flash memory demand of industrial market, the Industrial Series SSD products utilize Single-Level Cell (SLC) NAND Flash Memory. This enables the products to meet the critical standard of OEMs serving applications such as Datacenters, Storage, Virtualization, Telecommunications, Automation, Manufacturing, Military and Medical applications. Meanwhile, within the adoption of Single-Level Cell (SLC) NAND Flash Memory, this series is able to provide highest value on reliability, speed, lifespan, and supply consistency. 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, the Industrial Series could also provide rugged features in industrial PC under an extreme environment with a high MTBF.

2. Block Diagram



Figure1: Block diagram



3. Mechanical Information

3.1 Physical Specifications

Physical dimensions and weight			
Length (mm)	Width (mm)	Height (mm)	Weight (g)
100.20 ± 0.20	69.85 ± 0.20	9.3 ± 0.20	≤63



Figure2: Structure Diagram

3.2 Interface Description



Figure3: Interface Connector



3.3 Pin Assignments

Pin#	Assignment	Description
Signal		
S 1	GND	2 nd mate
S2	A+	Differential
S3	A-	From physical layer electronics
S4	GND	2 nd mate
S5	В-	Differential
S6	B+	From physical layer electronics
S7	GND	2 nd mate
Power		
P1	V33	3.3V power (Unused)
P2	V33	3.3V power (Unused)
Р3	V33	3.3V power (Unused)
P4	GND	1 st mate
Р5	GND	2 nd mate
Р6	GND	2 nd mate
P7	V5	5V power, pre-charge, 2 nd mate
P8	V5	5V power
Р9	V5	5V power
P10	GND	2 nd mate
P11	DAS/DSS	NC
P12	GND	2 nd mate
P13	V12	12V power, pre-charge, 2 nd mate (Unused)
P14	V12	12V power (Unused)
P15	V12	12V power (Unused)



4. Reliability Specification

Wear-leveling

BIWIN SSD support both static and dynamic wear-leveling technology. These two algorithms guarantee each block of flash memory at same level of erase cycles to improve lifetime limitation of NAND based storage

Endurance

Endurance: Total bytes written (TBW):

Density	Endurance: Total bytes written (TBW)
4GB	273TB
8GB	546TB
16GB	1093TB
32GB	2187TB
64GB	4374TB
128GB	8748TB

Notes: Total bytes written =((FLASH P/E cycle)×(number of bits in drive))/WAI

Read endurance: unlimited

MTBF

Mean time between failures (MTBFs) for the SSD can be predicted based on the component reliability data using the methods referenced in the Telcordia SR-332 reliability prediction procedures for electronic equipment, The prediction result for this SSD is more than2,000,000 hours.

Data retention

Data retention at $25^{\circ}C :> 10$ years



5. Electrical Specification

5.1 SATA Typical Power Consumption

Density	Idle	Sleep	Read	Write	Unit
4GB	0.30	0.30	0.75	0.81	W
8GB	0.30	0.30	0.75	0.81	W
16GB	0.30	0.30	0.86	0.98	W
32GB	0.30	0.30	1.03	1.28	W
64GB	0.30	0.30	1.03	1.30	W
128GB	0.30	0.30	1.03	1.30	W

5.2 Absolute Maximum Rating

Parameter	Symbol	Min	Max	Unit
Voltage input	V5	4.75	5.25	V
Operating temperature		-40	85	°C
Non-operating temperature		-55	95	°C
Rate of temperature change		-	20	°C/hour
Relative humidity (non condensing)		5	95	%

Stresses greater than those listed may cause permanent damage to the device. This is a stress rating only, and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

5.3 Shock and Vibration

Parameter/Condition	Specification
Operating shock (I5201)	100G, 6msec, 3 shocks for X1,X2,Y1,Y2,Z1,Z2 respectively (each ends of mutually perpendicular 3 axis)
Operating vibration	 10-500Hz, Full amplitude: 1.52mm or 4Gmax *1 for 15 min/cycle(reciprocating) 12 cycles for mutually perpendicular axis X,Y,Z respectively.



6. Command Descriptions

Support ATA Command

Command Name	Code (Hex)	Command Name	Code (Hex)
CHECK POWER MODE	E5h	SECURITY ERASE UNIT	F4h
EXECUTE DIAGNOSTICS	90h	SECURITY FREEZE LOCK	F5h
FLUSH CACHE	E7h	SECURITY SET PASSWORD	F1h
IDENTIFY DEVICE	ECh	SECURITY UNLOCK	F2h
IDLE	E3h	SEEK	7xh
IDLE IMMEDIATE	E1h	SET FEATURES	EFh
INITIALIZE DEVICE	91h	SET MULTIPLE MODE	C6h
PARAMETERS			
READ DMA	C8h or C9h	SLEEP	E6h
READ MULTIPLE	C4h	SMART	B0h
READ SECTOR(S)	20h or 21h	STANDBY	E2h
READ VERIFY SECTOR(S)	40h or 41h	STANDBY IMMEDIATE	E0h
RECALIBRATE	10h	WRITE DMA	CAh or CBh
SECURITY DISABLE	F6h	WRITE MULTIPLE	C5h
PASSWORD			
SECURITY ERASE PREPARE	F3h	WRITE SECTOR(S)	30h or 31h

ATA COMMAND SPECIFICATIONS

CHECK POWER MODE (E5h)

The host can use this command to determine the current power management mode.

EXECUTE DIAGNOSITICS (90h)

This command performs the internal diagnostic tests implemented by the drive. See ERROR register for diagnostic codes.

FLUSH CACHE (E7h)

This command is used by the host to request the device to flush the write cache. If there is data in the write cache, that data shall be written to the media. The BSY bit shall remain set to one until all data has been successfully written or an error occurs.

IDENTIFY DEVICE (ECh)

This commands read out 512Bytes of drive parameter information. Parameter Information consists of the arrangement and value as shown in the following table. This command enables the host to receive the Identify Drive Information from the device.



IDLE (E3h)

This command causes the device to set BSY, enter the idle mode, clear BSY and generate an interrupt. If sector count is non-zero, the automatic power down mode is enabled. If the sector count is zero, the automatic power mode is disabled.

IDLE IMMEDIATE (E1h)

This command causes the device to set BSY, enter the Idle (Read) mode, clear BSY and generate an interrupt.

INITIALIZE DEVICE PARAMETERS (91h)

This command enables the host to set the number of sectors per track and the number of tracks per heads.

READ DMA (C8h)

Read data from sectors during Ultra DMA and Multiword DMA transfer. Use the SET FEATURES command to specify the mode value. A sector count of zero requests 256 sectors.

READ MULTIPLE (C4h)

This command performs similarly to the Read Sectors command. Interrupts are not generated on each sector, but on the transfer of a block which contains the number of sectors defined by a Set Multiple command.

READ SECTOR(S) (20h/21h)

This command reads 1 to 256 sectors as specified in the Sector Count register from sectors which is set by Sector number register. Each sector of count 0 requests 256 sectors. The transfer beings specified in the Sector Number register.

READ VERIFY SECTOR(S) (40h/41h)

This command verifies one or more sectors on the drive by transferring data from the flash media to the data buffer in the drive and verifying that the ECC is correct. This command is identical to the Read Sectors command, except that DRQ is never set and no data is transferred to the host.

RECALIBRATE (10h)

The current drive performs no processing if it receives this command. It is supported for backward compatibility with previous devices.

SECURITY DISABLE PASSWORD (F6h)

Disables any previously set user password and cancels the lock. The host transfers 512 bytes of data, as shown in the following table, to the drive. The transferred data contains a user or master password, which the drive compares with the saved password. If they match, the drive cancels the lock. The master password is still saved. It is re-enabled by issuing the SECURITY SET PASSWORD command to re-set a user password.



SECURITY ERASE PREPARE (F3h)

This command shall be issued immediately before the Security Erase Unit command to enable erasing and unlocking. This command prevents accidental loss of data on the drive.

SECURITY ERASE UNIT (F4h)

The host uses this command to transfer 512 bytes of data, as shown in the following table, to the drive. The transferred data contains a user or master password, which the drive compares with the saved password. If they match, the drive deletes user data, disables the user password, and cancels the lock. The master password is still saved. It is re-enabled by issuing the SECURITY SET

SECURITY FREEZE LOCK (F5h)

Cause the drive to enter frozen mode. Once this command has been executed, the following commands to update a lock result in the

Aborted Command error:

- •SECURITY SET PASSWORD
- •SECURITY UNLOCK
- •SECURITY DISABLE PASSWORD
- •SECURITY ERASE PREPARE
- •SECURITY ERASE UNIT

The drive exits from frozen mode upon a power-off or hard reset. If the SECURITY FREEZE LOCK command is issued when the drive is placed in frozen mode, the drive executes the command, staying in frozen mode.

SECURITY SET PASSWORD (F1h)

This command set user password or master password. The host outputs sector data with PIO data-out protocol to indicate the information defined in the following table.

SECURITY UNLOCK (F2h)

This command used to disable LOCKED MODE of the device. This command transfers 512 bytes of data from the host with PIO data-out protocol. The following table defines the content of this information.

SEEK (7xh)

This command is effectively a NOP command to the device although it does perform a range check.

SET FEATURES (EFh)

This command set parameter to Features register and set drive FLS operation. For transfer mode, parameter is set to Sector Count Register. This command is used by the host to establish or select certain features.



Value	Function
02h	Enable write cache
03h	Set transfer mode based on value in Sector Count register
55h	Disable read look-ahead feature
82h	Disable write cache
AAh	Enable read look-ahead feature

SET MULTIPLE MODE (C6h)

This command enables the device to perform READ MULTIPLE and WRITE MULTIPLE operations and establishes the block count for these commands.

SLEEP (E6h)

This command causes the device to set BSY, enter the Sleep mode, clear BSY and generate an interrupt.

SMART Function Set (B0h)

Performs different processing required for predicting device failures, according to the subcommand specified in the Features register. If the Features register contains an unsupported value, the Aborted Command error is returned. If the SMART function is disabled, any subcommand other than SMART ENABLE OPERATIONS results in the Aborted Command error.

STANDBY (E2h)

This command causes the device to set BSY, enter the Sleep mode (which corresponds to the ATA Standby Mode), clear BSY and return the interrupt immediately.

STANDBY IMMEDIATE (E0h)

This command causes the drive to set BSY, enter the Sleep mode (which corresponds to the ATA! Standby Mode), clear BSY and return the interrupt immediately.

WRITE DMA (CAh)

Write data to sectors during Ultra DMA and Multiword DMA transfer. Use the SET FEATURES command to specify the mode value.

WRITE MULTIPLE (C5h)

This command is similar to the Write Sectors command. Interrupts are not presented on each sector, but on the transfer of a block which contains the number of sectors defined by Set Multiple command.

WRITE SECTOR(S) (30h/31h)

Write data to a specified number of sectors (1 to 256, as specified with the Sector Count register) from the specified address. Specify "00h"– to write 256 sectors.