AAEON Technology (Europe) B.V.

EP-SS25-256AACS

2.5’’ SATA SSD 256GB

3D TLC Specification

Version 1.1

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Revision History

Revision	Draft Date	History	Author
1.0	2018/08/01	First release	Kai Liu
1.1	2018/08/22	Revision of the document.	Pascal van Buytene

Product Overview

- **Capacity**
  - 256G

SATA Interface

- SATA Revision 3.2
- SATA 1.5Gbps, 3Gbps, and 6Gbps interface

Flash Interface

- Flash Type: BiCS3 3D TLC
- 2pcs to 8pcs of BGA132/152 flash

Performance

- Read: up to 560 MB/s
- Write: up to 540 MB/s

Power Consumption[Note1]

- Active mode: < 3,210mW
- Idle mode: < 220mW

- **MTBF**
  - 1.8 million
- **Advanced Flash Management**
  - Static and Dynamic Wear Leveling
  - Bad Block Management
  - TRIM
  - SMART
  - Over-Provision
  - Firmware Update
- **Low Power Management**
  - DIPM/HIPM/DEVSLP Mode
- **Temperature Range**
  - Operation: 0°C ~ 70°C
  - Storage: -40°C ~ 85°C
- **RoHS compliant**

Notes:

1. Please see “4.2 Power Consumption” for details.

Performance and Power Consumption

Capacity	Flash Structure	Performance				Power Consumption		
		CrystalDiskMark		Iometer				
		Read (MB/s)	Write (MB/s)	4K Ran. Read (IOPS)	4K Ran. Write (IOPS)	Read (mW)	Write (mW)	Idle (mW)
256GB (240GB)	64GB x 4, BGA132/152, BiCS3 TLC	560	520	90,000	47,000	2,270	2,755	175

Notes:

1. Iometer test range is 8GB LBA with QD32.
2. Please see “4.2 Power Consumption” for details.
3. Power is based on IOMeter to measure

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1. INTRODUCTION

1.1. General Description

AAEON 2.5" SATA SSD delivers all the advantages of flash disk technology with Serial ATA I/II/III interface, including being fully compliant with standard 2.5-inch form factor, providing low power consumption compared to traditional hard drive and hot-swapping when removing/replacing/upgrading flash disks. The device is designed based on the standard 7-pin interface for data segment and 15-pin for power segment, as well as operating at a maximum operating frequency of 300MHz with 30MHz external crystal. Its capacity could provide a wide range up to 1TB. Moreover, it can reach up to 560MB/s read as well as 540MB/s write high performance based on Toshiba's BiCS3 3D Toggle TLC flash (with 1024MB DDR3 cache enabled and measured by CrystalDiskMark v5.0). Meanwhile, the power consumption of the 2.5" SSD is much lower than traditional hard drives.

1.2. Controller Block Diagram

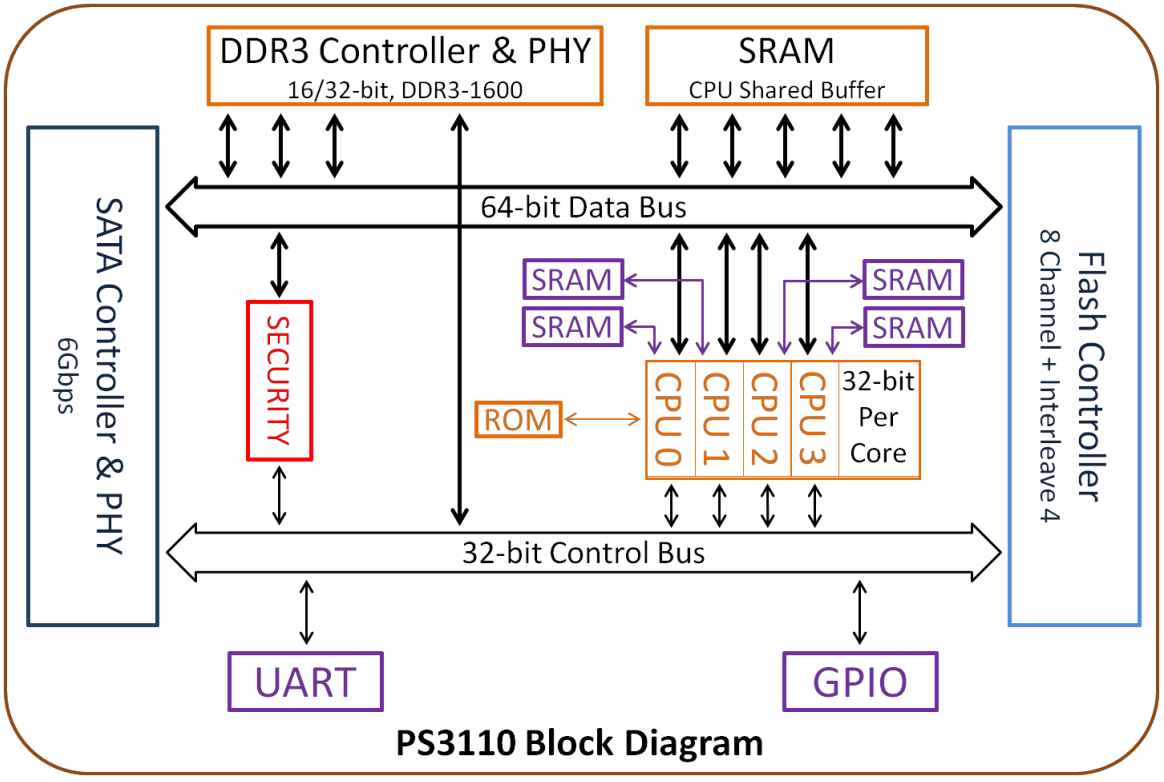


Figure 1-1 PS3110-S10 2.5'' SATA SSD Controller Block Diagram

1.3. Product Block Diagram

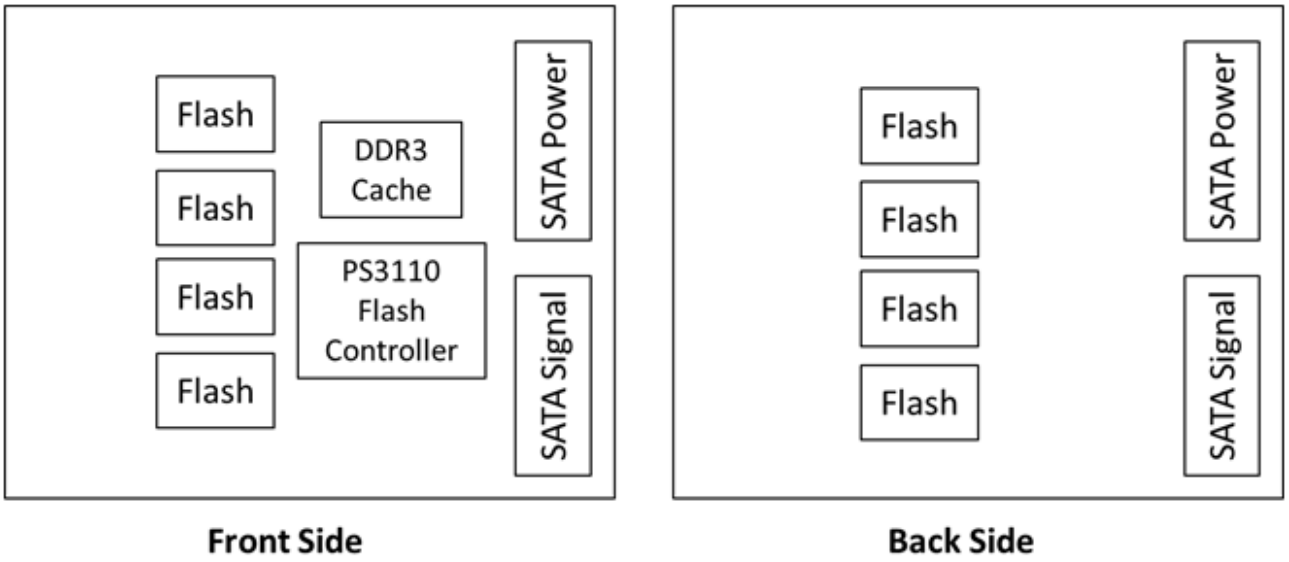


Figure 1-2 PS3110-S10 2.5'' SATA SSD Product Block Diagram

1.4. Flash Management

1.4.1. Error Correction Code (ECC)

Flash memory cells will deteriorate with use, which might generate random bit errors in the stored data. Thus, PS3110-S10 SATA SSD applies the BCH ECC algorithm, which can detect and correct 120bits/2K Byte errors occur during read process, ensure data been read correctly, as well as protect data from corruption.

1.4.2. Wear Leveling

NAND flash devices can only undergo a limited number of program/erase cycles, and in most cases, the flash media are not used evenly. If some areas get updated more frequently than others, the lifetime of the device would be reduced significantly. Thus, Wear Leveling is applied to extend the lifespan of NAND Flash by evenly distributing write and erase cycles across the media.

AAEON provides advanced Wear Leveling algorithm, which can efficiently spread out the flash usage through the whole flash media area. Moreover, by implementing both dynamic and static Wear Leveling algorithms, the life expectancy of the NAND flash is greatly improved.

1.4.3. Bad Block Management

Bad blocks are blocks that include one or more invalid bits, and their reliability is not guaranteed. Blocks that are identified and marked as bad by the manufacturer are referred to as “Initial Bad Blocks”. Bad blocks that are developed during the lifespan of the flash are named “Later Bad Blocks”. AAEON implements an efficient bad block management algorithm to detect the factory-produced bad blocks and manages any bad blocks that appear with use. This practice further prevents data being stored into bad blocks and improves the data reliability.

1.4.4. TRIM

TRIM is a feature which helps improve the read/write performance and speed of solid-state drives (SSD). Unlike hard disk drives (HDD), SSDs are not able to overwrite existing data, so the available space gradually becomes smaller with each use. With the TRIM command, the operating system can inform the SSD which blocks of data are no longer in use and can be removed permanently. Thus, the SSD will perform the erase action, which prevents unused data from occupying blocks all the time.

1.4.5. SMART

SMART, an acronym for Self-Monitoring, Analysis and Reporting Technology, is an open standard that allows a disk drive to automatically detect its health and report potential failures. When a failure is recorded by SMART, users can choose to replace the drive to prevent unexpected outage or data loss. Moreover, SMART can inform users of impending failures while there is still time to perform proactive actions, such as copy data to another device.

1.4.6. Over-Provision

Over Provisioning refers to the inclusion of extra NAND capacity in a SSD, which is not accessible by users. With Over Provisioning, the performance and IOPS (Input/Output Operations per Second) are improved by providing the controller additional space to manage P/E cycles, which enhances the reliability and endurance as well. Moreover, the write amplification of the SSD becomes lower when the controller writes data to the flash.

1.4.7. Firmware Upgrade

Firmware can be considered as a set of instructions on how the device communicates with the host. Firmware will be upgradable when new features are added, compatibility issues are fixed, or read/write performance gets improved.

1.5. Low Power Management

1.5.1. DIPM/HIPM/DEVSLP Mode

SATA interfaces contain two low power management states for power saving: Partial and Slumber modes. For Partial mode, the device has to resume to full operation within 10 microseconds, whereas the device will spend 10 milliseconds to become fully operational in the Slumber mode. SATA interfaces allow low power modes to be initiated by Host (HIPM, Host Initiated Power Management) or Device (DIPM, Device Initiated Power Management). As for HIPM, Partial or Slumber mode can be invoked directly by the software. For DIPM, the device will send requests to enter Partial or Slumber mode.

And for the PS3110-S10 SSD, it can also support the DEVSLP mode for the power saving feature.

1.6. Power Loss Protection: Flushing Mechanism

Power Loss Protection is a mechanism to prevent data loss during unexpected power failure. DRAM is a volatile memory and frequently used as temporary cache or buffer between the controller and the NAND flash to improve the SSD performance. However, one major concern of the DRAM is that it is not able to keep data during power failure. Accordingly, the PS3110-S10 applies the ***GuaranteedFlush*** technology, which requests the controller to transfer data to the cache. For PS3110-S10, DDR performs as a cache, and its sizes include 512MB. Only when the data is fully committed to the NAND flash will the controller send acknowledgement (ACK) to the host. Such implementation can prevent false-positive performance and the risk of power cycling issues.

Additionally, it is critical for a controller to shorten the time the in-flight data stays in the cache. Thus, AAEON's PS3110-S10 applies an algorithm to reduce the amount of data resides in the cache to provide a better performance. This ***SmartCacheFlush*** technology allows incoming data to only have a "pit stop" in the cache and then move to the NAND flash at once. If the flash is jammed due to particular file sizes (such as random 4KB data), the cache will be treated as an "organizer", consolidating incoming data into groups before written into the flash to improve write amplification.

In sum, with Flush Mechanism, PS3110-S10 proves to provide the reliability required by consumer,

rial, and enterprise-level applications.

1.7. Advanced Device Security Features

1.7.1. Secure Erase

Secure Erase is a standard ATA command and will write all “0x00” to fully wipe all the data on hard drives and SSDs. When this command is issued, the SSD controller will empty its storage blocks and return to its factory default settings.

1.7.2. Write Protect

When a SSD contains too many bad blocks and data are continuously written in, then the SSD might not be usable anymore. Thus, Write Protect is a mechanism to prevent data from being written in and protect the accuracy of data that are already stored in the SSD.

1.8. SSD Lifetime Management

1.8.1. Thermal Monitor (Optional)

Thermal monitors are devices for measuring temperature and can be found in SSDs in order to issue warnings when SSDs go beyond a certain temperature. The higher temperature the thermal monitor detects, the more power the SSD consumes, causing the SSD to get aging quickly. Hence, the processing speed of a SSD should be under control to prevent temperature from exceeding a certain range. Meanwhile, the SSD can achieve power savings.

1.9. An Adaptive Approach to Performance Tuning

1.9.1. Throughput

Based on the available space of the disk, PS3110-S10 will regulate the read/write speed and manage the performance of throughput. When there still remains a lot of space, the firmware will continuously perform read/write action. There is still no need to implement garbage collection to allocate and release memory, which will accelerate the read/write processing to improve the performance. Contrarily, when the space is going to be used up, PS3110-S10 will slow down the read/write processing and implement garbage collection to release memory. Hence, read/write performance will become slower.

1.9.2. Predict & Fetch

Normally, when the Host tries to read data from the SSD, the SSD will only perform one read action after receiving one command. However, PS3110-S10 applies ***Predict & Fetch*** to improve the read speed. When the host issues sequential read commands to the SSD, the SSD will automatically expect that the following will also be read commands. Thus, before receiving the next command, flash has already prepared the data. Accordingly, this accelerates the data processing time, and the host does not need to wait so long to receive data.

2. PRODUCT SPECIFICATIONS

- **Capacity**
  - Supported capacity[Note1] : 256GB (support 48-bit addressing mode)
- **Electrical/Physical Interface**
  - SATA Interface
    - Compliant with SATA Revision 3.2
    - Compatible with SATA 1.5Gbps, 3Gbps and 6Gbps interface
    - NCQ support up to queue depth = 32
    - Support power management
    - Support expanded register for SATA protocol 48 bits addressing mode
    - Embedded BIST function for SATA PHY for low cost mass production
- **Supported NAND Flash**
  - Toshiba BiCS3 3D TLC
  - Contain up to 8pcs of BGA flash
- **ECC Scheme**
  - PS3110-S10 2.5” SSD can correct up to 120 bits error in 2K Byte data.
- **UART function**
- **GPIO**
- **Support SMART and TRIM commands**
- **Support Log Drive Feature**

- **Performance**

Capacity	Flash Structure	Performance			
		CrystalDiskMark		Iometer	
		Read (MB/s)	Write (MB/s)	4K Ran. Read (IOPS)	4K Ran. Write (IOPS)
256GB (240GB)	64GB x 4, BGA132/152, BiCS3 TLC	560	520	90,000	47,000

1. The performance was measured using CrystalDiskMark with SATA 6Gbps host.
2. Iometer test range is 8GB LBA with QD32.
3. Samples were built using Toshiba BiCS3 3D Toggle TLC NAND flash
4. Performance may differ according to flash configuration and platform
5. The table above is for reference only. The criteria for MP (mass production) and for accepting goods shall be discussed based on different flash configuration

3. ENVIRONMENTAL SPECIFICATIONS

3.1. Environmental Conditions

3.1.1. Temperature and Humidity

- Temperature:
  - Storage: -40°C to 85°C
  - Operational: 0°C to 70°C
- Humidity: RH 90% under 40°C (operational)

Table 3-1 High Temperature Test Condition

	Temperature	Humidity	Test Time
Operation	70°C	0% RH	72 hours
Storage	85°C	0% RH	72 hours

Result: No any abnormality is detected.

Table 3-2 Low Temperature Test Condition

	Temperature	Humidity	Test Time
Operation	0°C	0% RH	72 hours
Storage	-40°C	0% RH	72 hours

Result: No any abnormality is detected.

Table 3-3 High Humidity Test Condition

	Temperature	Humidity	Test Time
Operation	40°C	90% RH	4 hours
Storage	40°C	93% RH	72 hours

Result: No any abnormality is detected.

Table 3-4 Temperature Cycle Test

	Temperature	Test Time	Cycle
Operation	0°C 70°C	30 min 30 min	10 Cycles
Storage	-40°C 85°C	30 min 30 min	10 Cycles

Result: No any abnormality is detected.

3.1.2. Shock

Table 3-5 PS3110-S10 2.5'' SATA SSD Shock Specification

	Acceleration Force	Half Sin Pulse Duration
Non-operational	1500G	0.5ms

Result: No any abnormality is detected when power on.

3.1.3. Vibration

Table 3-6 PS3110-S10 2.5'' SATA SSD Vibration Specification

	Condition		Vibration Orientation
	Frequency/Displacement	Frequency/Acceleration	
Non-operational	20Hz~80Hz/1.52mm	80Hz~2000Hz/20G	X, Y, Z axis/30 min for each

Result: No any abnormality is detected when power on.

3.1.4. Drop

Table 3-7 PS3110-S10 2.5'' SATA SSD Drop Specification

	Height of Drop	Number of Drop
Non-operational	80cm free fall	6 face of each unit

Result: No any abnormality is detected when power on.

3.1.5. Bending

Table 3-8 PS3110-S10 2.5'' SATA SSD Bending Specification

	Force	Action
Non-operational	≥ 10N	Hold 1min/5times

Result: No any abnormality is detected when power on.

3.1.6. Torque

Table 3-9 PS3110-S10 2.5'' SATA SSD Torque Specification

	Force	Action
Non-operational	0.5N-m or 5 deg	Hold 5min/5times

Result: No any abnormality is detected when power on.

3.1.7. EMI Compliance

- FCC: CISPR22
- CE: EN55022
- BSMI : 13438

3.2. MTBF

- 2.5” SSD up to 1.8 Millions.

NOTES:

MTBF value is simulation based on the actual FIT rate report form component suppliers.

3.3. Certification & Compliance

- RoHS
- Halogen Free
- SATA III (SATA Rev. 3.2)
- Up to ATA/ATAPI-8 (Including S.M.A.R.T)
- WHCK

4. ELECTRICAL SPECIFICATIONS

4.1. Supply Voltage

Table 4-1 Supply Voltage of PS3110-S10 2.5'' SATA SSD

Parameter	Rating
Operating Voltage	5V+/-5%
Maximum Ripple	100mV, 0~30MHz

4.2. Power Consumption

Table 4-2 Power Consumption of PS3110-S10 2.5'' SATA SSD

Capacity	Flash Structure	Flash Type	Read	Write	Partial	Slumber	Idle
256GB (240GB)	64GB x 4	BGA, BiCS3 TLC	2,270	2,755	70	70	175

Unit: mW

NOTES:

1. The average value of power consumption is achieved based on 100% conversion efficiency.
2. The measured power voltage is 5V.
3. Samples were built of Toshiba BiCS3 3D Toggle TLC NAND flash and measured under ambient temperature.
4. Sequential R/W is measured while testing 1MB sequential R/W 3 times by IOMeter.
5. Power Consumption may differ according to flash configuration and platform.

5.1. Pin Assignment and Descriptions

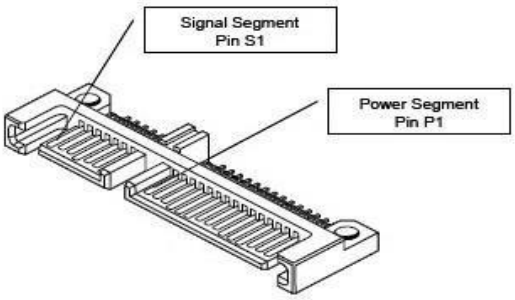


Figure 5-1 PS3110-S10 2.5'' SATA SSD Pin Assignment

Table 5-1 Signal Segment Pin Assignment and Descriptions

Pin Number	Function
S1	GND
S2	A+ (Differential Signal Pair A)
S3	A – (Differential Signal Pair A)
S4	GND
S5	B – (Differential Signal Pair B)
S6	B+ (Differential Signal Pair B)
S7	GND

Table 5-2 Power Segment Pin Assignment and Descriptions

Pin Number	Function
P1	Not Used (3.3V)
P2	Not Used (3.3V)
P3	DEVSLP
P4	GND
P5	GND
P6	GND
P7	5V pre-charge
P8	5V
P9	5V
P10	GND
P11	Reserved
P12	GND
P13	Not Used (12V pre-charge)
P14	Not Used (12V)
P15	Not Used (12V)

6. SUPPORTED COMMANDS

6.1. ATA Command List

Table 6-1 ATA Command List

Op-Code	Command Description	Op-Code		Command Description
00h	NOP	60h		Read FPDMA Queued
06h	Data Set Management	61h		Write FPDMA Queued
10h	Recalibrate	70h		Seek
20h	Read Sectors	90h		Execute Device Diagnostic
21h	Read Sectors without Retry	91h		Initialize Device Parameters
24h	Read Sectors EXT	92h		Download Microcode
25h	Read DMA EXT	93h		Download Microcode DMA
27h	Read Native Max Address EXT	B0h		SMART
29h	Read Multiple EXT	B0h	D0h	SMART READ DATA
2Fh	Read Log EXT	B0h	D1h	SMART READ DATA ATTRIBUTE THRESHOLD
30h	Write Sectors	B0h	D2h	SMART ENABLE/DISABLE ATTRIBUTE AUTOSAVE
31h	Write Sectors without Retry	B0h	D3h	SMART SAVE ATTRIBUTE VALUES
34h	Write Sectors EXT	B0h	D4h	SMART EXECUTE OFF-LINE IMMEDIATE
35h	Write DMA EXT	B0h	D5h	SMART READ LOG
37h	Set Native Max Address EXT	B0h	D6h	SMART WRITE LOG
39h	Write Multiple EXT	B0h	D8h	SMART ENABLE OPERATIONS
3Dh	Write DMA FUA EXT	B0h	D9h	SMART DISABLE OPERATIONS
3Fh	Write Long EXT	B0h	DAh	SMART RETURN STATUS
40h	Read Verify Sectors	B0h	DBh	SMART ENABLE/DISABLE AUTOMATIC OFF-LINE
41h	Read Verify Sectors without Retry	B1h		DEVICE CONFIGURATION OVERLAY
42h	Read Verify Sectors EXT	B1h	C0h	DEVICE CONFIGURATION RESTORE
45h	Write Uncorrectable EXT	B1h	C1h	DEVICE CONFIGURATION FREEZE LOCK
47h	Read Log DMA EXT	B1h	C2h	DEVICE CONFIGURATION IDENTIFY

Op-Code		Command Description	Op-Code			Command Description
B1h	C4h	DEVICE CONFIGURATION IDENTIFY DMA	ECh			Identify Device
B1h	C5h	DEVICE CONFIGURATION SET DMA	EFh			Set Features
C4h		Read Multiple	EFh	02h		Enable 8-bit PIO transfer mode
C5h		Write Multiple	EFh	03h		Set transfer mode based on value in Count field
C6h		Set Multiple Mode	EFh	05h		Enable advanced power management
C8h		Read DMA	EFh	10h		Enable use of Serial ATA feature
C9h		Read DMA without Retry	EFh	10h	02h	Enable DMA Setup FIS Auto-Activate optimization
CAh		Write DMA	EFh	10h	03h	Enable Device-initiated interface power state (DIPM)
CBh		Write DMA without Retry	EFh	10h	06h	Enable Software Settings Preservation (SSP)
CEh		Write Multiple FUA EXT	EFh	10h	07h	Enable Device Automatic Partial to Slumber transitions
E0h		Standby Immediate	EFh	10h	09h	Enable Device Sleep
E1h		Idle Immediate	EFh	55h		Disable read look-ahead feature
E2h		Standby	EFh	66h		Disable reverting to power-on defaults
E3h		Idle	EFh	82h		Disable write cache
E4h		Read Buffer	EFh	85h		Disable advanced power management
E5h		Check Power Mode	EFh	90h		Disable use of Serial ATA feature set
E6h		Sleep	EFh	90h	02h	Disable DMA Setup FIS Auto-Activate optimization
E7h		Flush Cache	EFh	90h	03h	Disable Device-initiated interface power state (DIPM)
E8h		Write Buffer	EFh	90h	06h	Disable Software Settings Preservation (SSP)
E9h		Read Buffer DMA	EFh	90h	07h	Disable Device Automatic Partial to Slumber transitions
EAh		Flush Cache EXT	EFh	90h	09h	Disable Device Sleep
EBh		Write Buffer DMA	EFh	AAh		Enable read look-ahead feature

Op-Code		Command Description	Op-Code	Command Description
EFh	CCh	Enable reverting to power-on defaults	F4h	Security Erase Unit
F1h		Security Set Password	F5h	Security Freeze Lock
F2h		Security Unlock	F6h	Security Disable Password
F3h		Security Erase Prepare	F8h	Read Native Max Address

6.2. Identify Device Data

The following table details the sector data returned by the IDENTIFY DEVICE command.

Table 6-2 List of Device Identification

Word	ATA Identify Parameter	Value
0	General configuration	0040h
1	Number of cylinders in the default CHS translation	3FFFh
2	Specific configuration	C837h
3	Number of heads in the default CHS translation	0010h
4-5	Retired	0000h
6	Number of sectors per track in the default CHS translation	003Fh
7-8	Reserved for the CFA	0000h
9	Obsolete	0000h
10-19	Serial number	ASCII
20	Retired	0000h
21	Retired	0000h
22	Obsolete	0000h
23-26	Firmware revision	ASCII
27-46	Model number	ASCII
47	READ/WRITE MULTIPLE commands function	8010h
48	Trusted Computing feature set options	4000h
49	Capabilities	2F00h
50	Capabilities	4000h
51-52	Obsolete	0000h
53	field validity	0007h
54	Number of cylinders in the current CHS translation	3FFFh
55	Number of heads in the current CHS translation	0010h
56	Number of sectors per track in the current CHS translation	003Fh
57-58	Current capacity in sectors	00FBFC10h
59	Multiple sector setting	9D10h
60-61	Total number of user addressable logical sectors for 28-bit commands	*3
62	Obsolete	0000h
63	Multiword DMA modes	0407h
64	PIO mode supported	0003h
65	Minimum Multiword DMA transfer cycle time per word	0078h
66	Manufacturer's recommended Multiword DMA transfer cycle time	0078h

Word	ATA Identify Parameter	Value
67	Minimum PIO transfer cycle time without flow control	0078h
68	Minimum PIO transfer cycle time with IORDY flow control	0078h
69	Additional Supported	5F20h
70-73	Reserved	0000h
74	Reserved	0000h
75	Queue depth	001Fh
76	Serial ATA Capabilities	E70Eh
77	Supported Serial ATA Phy speed	86h/84h/82h
78	Serial ATA features supported	054Ch
79	Serial ATA features enabled	0040h
80	Major version number	03F8h
81	Minor version number	0000h
82	Commands and feature sets supported	746Bh
83	Commands and feature sets supported	7D09h
84	Commands and feature sets supported	4163h
85	Commands and feature sets supported or enabled	7469h
86	Commands and feature sets supported or enabled	BC09h
87	Commands and feature sets supported or enabled	4163h
88	Ultra DMA modes	007Fh
89	Time required for Normal Erase mode SECURITY ERASE UNIT command	0001h
90	Time required for an Enhanced Erase mode SECURITY ERASE UNIT command	0001h
91	Current APM level value	00FEh
92	Master Password Identifier	FFFEh
93	Hardware reset result	0000h
94	Current AAM value	0000h
95	Stream Minimum Request Size	0000h
96	Streaming Transfer Time - DMA	0000h
97	Streaming Access Latency -DMA and PIO	0000h
98-99	Streaming Performance Granularity	0000h
100-103	Total Number of User Addressable Logical Sectors for 48-bit commands	*4
104	Streaming Transfer Time - PIO	0000h
105	Maximum number of 512-byte blocks of LBA Range Entries per DATA SET MANAGEMENT command	0008h

Word	ATA Identify Parameter	Value
106	Physical sector size / logical sector size	4000h
107	Inter-seek delay for ISO 7999 standard acoustic testing	0000h
108-111	World wide name	Vender Specific
112-115	Reserved	0000h
116	Reserved for TLC	0000h
117-118	Logical sector size	0000h
119	Commands and feature sets supported	401Dh
120	Commands and feature sets supported or enabled	401Dh
121-124	Reserved for expanded supported and enabled settings	0000h
125-126	Reserved for expanded supported and enabled settings	0000h
127	Obsolete	0000h
128	Security status	0021h
129-159	Vendor specific	0000h
160	CFA power mode	0000h
161-164	Reserved for the CFA	0000h
165-167	Reserved for the CFA	0000h
168	Device Nominal Form Factor	0003h
169	DATA SET MANAGEMENT is supported	0001h
170-173	Additional Product Identifier	0000h
174-175	Reserved	0000h
176-205	Current media serial number	0000h
206	SCT Command Transport	0000h
207-208	Reserved for CE-ATA	0000h
209	Alignment of logical blocks within a physical block	4000h
210-211	Write-Read-Verify Sector Count Mode 3	0000h
212-213	Write-Read-Verify Sector Count Mode 2	0000h
214	NV Cache Capabilities	0000h
215-216	NV Cache Size in Logical Blocks	0000h
217	Nominal media rotation rate	0001h
218	Reserved	0000h
219	NV Cache Options	0000h
220	Current mode of the Write-Read-Verify feature set	0000h
221	Reserved	0000h
222	Transport major version number	107Fh
223	Transport minor version number	0000h
224-227	Reversed for CE-ATA	0000h
228-229	Reversed for CE-ATA	0000h

Word	ATA Identify Parameter	Value
230-233	Extend Number of User Addressable Sectors	0000h
234	Minimum number of 512-byte data blocks per DOWNLOAD MICROCODE command for mode 03h	0001h
235	Maximum number of 512-byte data blocks per DOWNLOAD MICROCODE command for mode 03h	FFFFh
236-239	Reserved	0000h
240-242	Reserved	0000h
243	Reserved	0000h
244-247	Reserved	0000h
248-251	Reserved	0000h
252-254	Reserved	0000h
255	Integrity word	xxA5h

Table 6-3 List of Device Identification for 256G Capacity

Capacity (GB)	*1 (Word 1/Word 54)	*2 (Word 57 – 58)	*3 (Word 60 – 61)	*4 (Word 100 – 103)
256	3FFFh	FBFC10h	FFFFFFFh	1DCF32B0

7. PHYSICAL DIMENSION

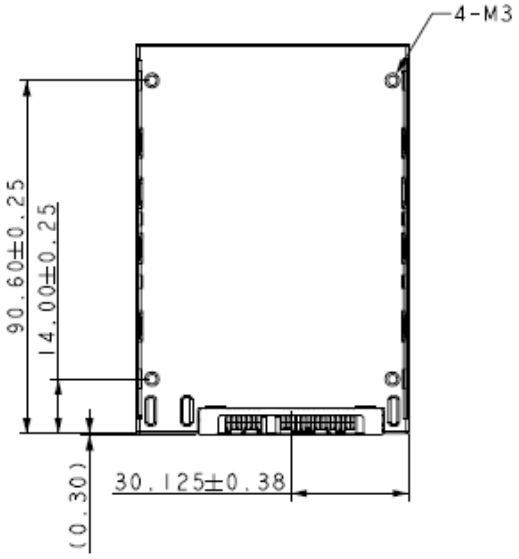
- **100.00mm (L) x 69.85mm (W) x 7.00mm (H)**

  PCB PN: A069010ME008401N

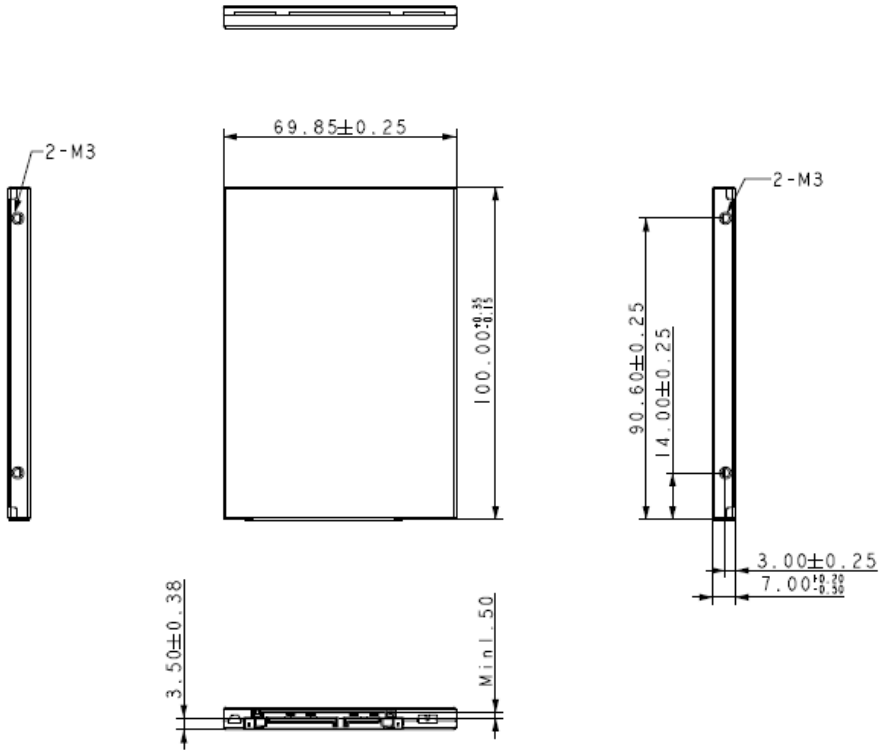
  Connector Material : Au

Golden Finger Thickness : 15u”

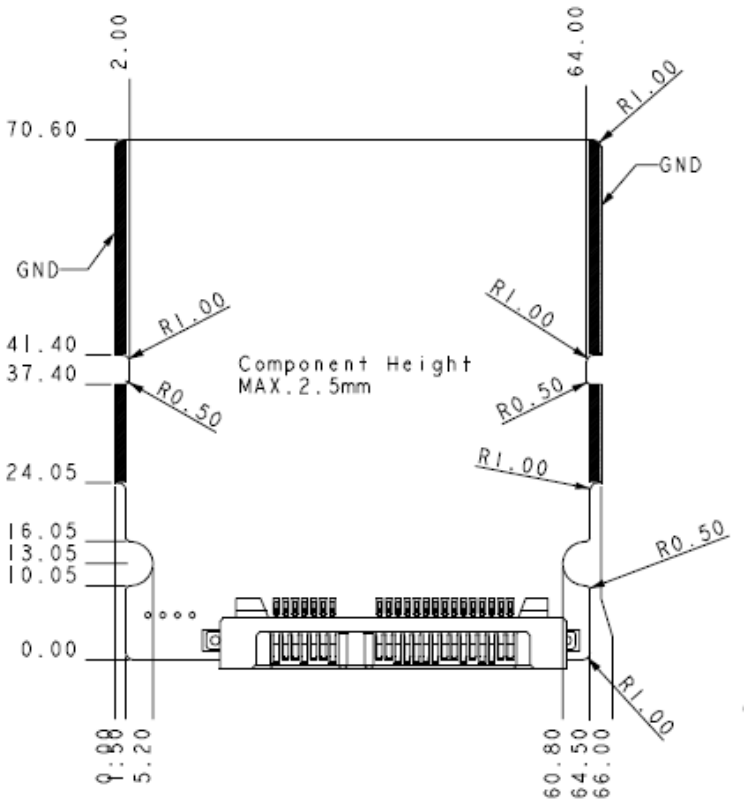
Bottom View



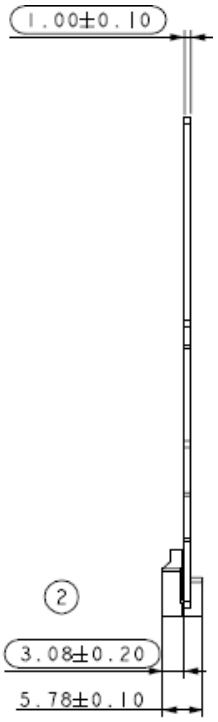
Top View/Side View



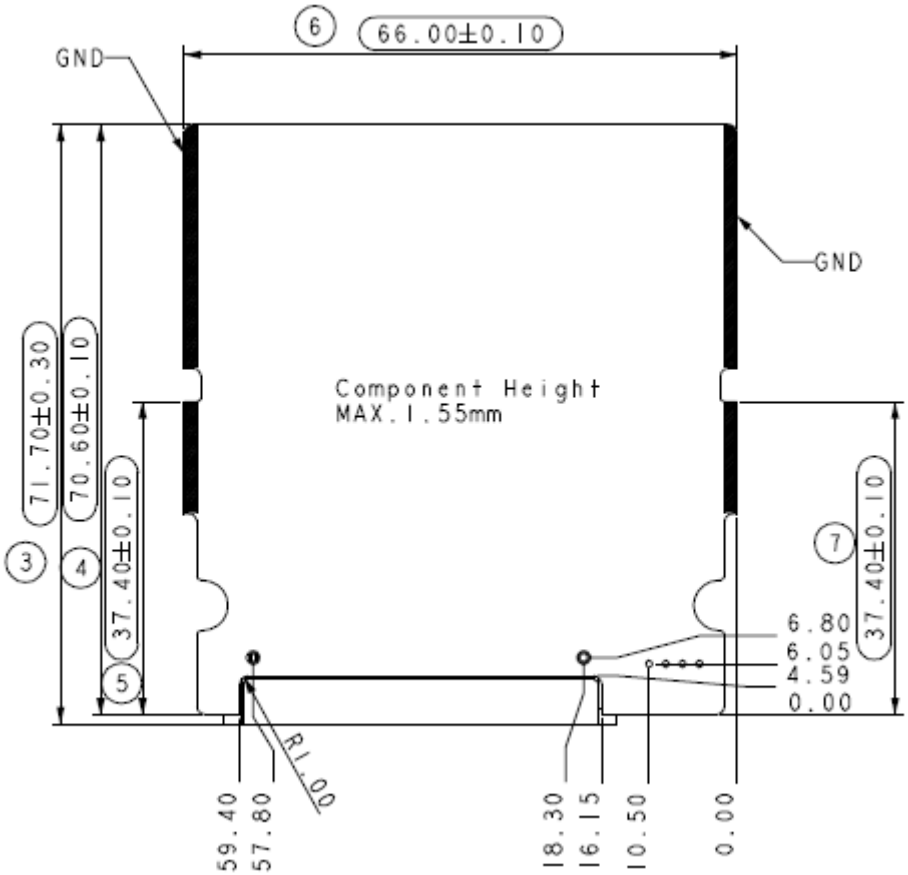
PCB Drawing : A069010ME008401N (BGA x 8pcs)



Top View



Side View



Bottom View

8. REFERENCES

The following table is to list out the standards that have been adopted for designing the product.

Table 9-1 List of References

Title	Acronym/Source
RoHS	Restriction of Hazardous Substances Directive; for further information, please contact us as info@aaeon.eu.
Serial ATA Revision 3.2	http://www.sata-io.org
ATA-8 spec	http://www.t13.org

9. TERMINOLOGY

The following table is to list out the acronyms that have been applied throughout the document.

Table 10-1 List of Terminology

Term	Definitions
ATTO	Commercial performance benchmark application
DDR	Double data rate (SDRAM)
DIPM	Device initiated power management
HIPM	Host initiated power management
LBA	Logical block addressing
MB	Mega-byte
MTBF	Mean time between failures
NCQ	Native command queue
SATA	Serial advanced technology attachment
S.M.A.R.T.	Self-monitoring, analysis and reporting technology
SSD	Solid state disk

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