

Industrial SATAⅢ 2.5inch
Solid State Drive A-Series
データシート

株式会社アドテック

Revision History

Revision	Description	Date
V1.0	New released	September, 2019

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1. Product Description

1.1. Product Overview

ADTEC SSD is a SATA III 6Gb/s SSD device built with high performance, quality flash memory, consists of MLC chip. Respectively, with sequential read and write speeds of up to 490 and 360 MB/sec, both can enhance computer performance and meet user needs for highly stable and reliable storage solutions. In addition to buffer management through dynamical allocation, SSD adopts the global wear-leveling scheme to allow uniform use of all storage blocks, ensuring that the lifespan of a flash media can be significantly increased and the disk performance is optimized as well. ADTEC SSD is the perfect storage device for industrial PCs, POS, embedded computer, gaming systems, and handheld devices.

1.2. Product Features

- Memory Capacities
MLC: 64GB/ 128GB / 256GB / 512GB / 1TB
aMLC: 32GB/ 64GB/ 128GB / 256GB / 512GB
- High performance. Enhanced user experience.
- Support DDR3/DDR3L External DRAM Buffer.
- Build-in Global Wear-leveling and Hardware BCH ECC capable of correcting errors up to 66 bit/1KB.
- Management for long data retention.
- Compliant with SATA III 6.0Gbps (backward compatible to 3 Gb/s 1.5 G/s)
- Operating as Boot Disk.
- Support S. M. A. R. T., Security & Trim command.
- Noiseless and stable installation to system.
- Silent, low-power operation. Resistant to shock and vibration.
- Automatic sleep and wake-up mechanism to save power.
- Compliant with Serial ATA Revision 3.1 / ATA-8 specification.
- Supports Bad Block Management.
- CE and FCC Compatibility.

1.3. Specifications

Interface	SATAIII 6Gb/s compatible
NAND Flash Type	MLC/aMLC
Controller	SM2246EN
Form Factor	2.5inch
Connector Type	SATA (7+15 pin)
External DRAM Buffer	Yes
Capacity	MLC: 64GB / 128GB / 256GB / 512GB / 1TB aMLC: 32GB / 64GB / 128GB / 256GB / 512GB
Power Consumption(Max)	Idle: 0.41W, Active: 4.18W
Temperature	Operating Temperature: Normal Temperature: 0°C ~ +70°C Wide Temperature: -40°C ~ +85°C Storage Temperature: -55°C ~ +95°C
Humidity	0°C~55°C /10~95%, non-condensing
TRIM	Yes
S.M.A.R.T(Health Monitor)	Yes
Security Tool	Yes
Vibration(Operating)	20GPeak, 7 ~ 2000Hz
Shock	1500G,0.5ms
Dimension(L x W x H)	100 x 69.85 x 7mm
Weight	75 g

Table 1: 2.5" SATA SSD Specifications

1.4. Performance

MLC

Capacity	64GB	128GB	256GB	512GB	1TB
Sequential Read(Max)	450MB/sec	490MB/sec	458MB/sec	486MB/sec	492MB/sec
Sequential Write(Max)	85MB/sec	180MB/sec	358MB/sec	404MB/sec	399MB/sec

aMLC

Capacity	32GB	64GB	128GB	256GB	512GB
Sequential Read(Max)	482MB/sec	485MB/sec	492MB/sec	495MB/sec	486MB/sec
Sequential Write(Max)	220MB/sec	300MB/sec	335MB/sec	367MB/sec	461MB/sec

*Performance may vary based on SSD capacity, hardware test platform, test software, operating system and other system variables.

Table 2: 2.5" SATA SSD Performance

1.5. TBW (Tera Bytes Written)

Capacity	TBW(MLC)	TBW(aMLC)
32GB	—	320TB
64GB	96TB	641TB
128GB	192TB	1282TB
256GB	385TB	2564TB
512GB	796TB	5128TB
1TB	1538TB	—

Table 3: 2.5" SATA SSD TBW

1.6. System Requirement

The Host system which is connected to 2.5" SATA SSD should meet system requirements at minimum.

1.6.1. Supply Voltage

Item	Rating
Input voltage	+5V DC \pm 5%

Table 4: 2.5" SATA SSD Supply Voltage

1.6.2. Power Consumption

Item	Rating
Idle (Max.)	0.41W
Active (Max.)	4.18W

Table 5: 2.5" SATA SSD Power Consumption

1.6.3. Operating System

- Windows family.
- Linux family.
- DOS or embedded system.

2. Detailed Specification

2.1. Physical Specifications

2.1.1. Overview



Figure 1: 2.5" SATA SSD Overview Diagram

2.1.2. Dimension

The Dimensions of 2.5" SATA SSD are illustrated in Figure 2 and described in Table 4.

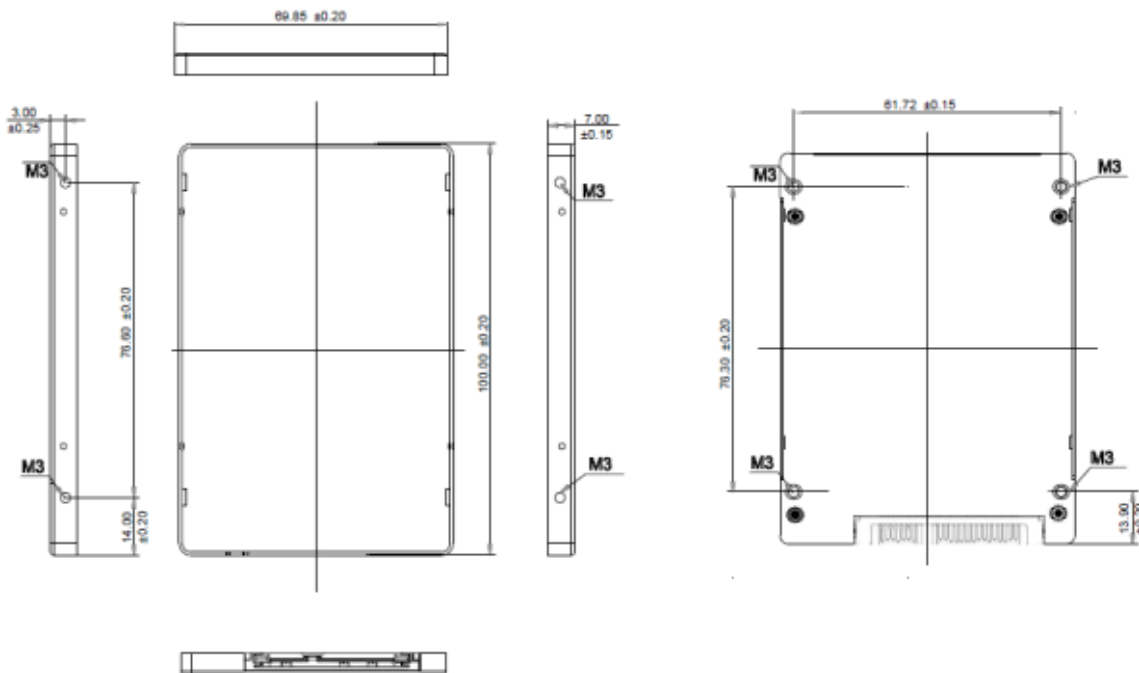


Figure 2: 2.5" SATA SSD Module Dimensions

Parameter	Specifications
Width	100mm +0.20 / -0.15mm
Length	69.85mm +0.20 / -0.15mm
Height	7mm ± 0.20mm

Table 6: 2.5” SATA SSD Module Physical Dimension

2.2. Electronic Specifications

2.2.1. Product Definition

2.5” SATA SSD is designed to operate and work as Data or Code Storage device by NAND Flash Memory and its Controller through Serial ATA Standard Interface to Host Systems.

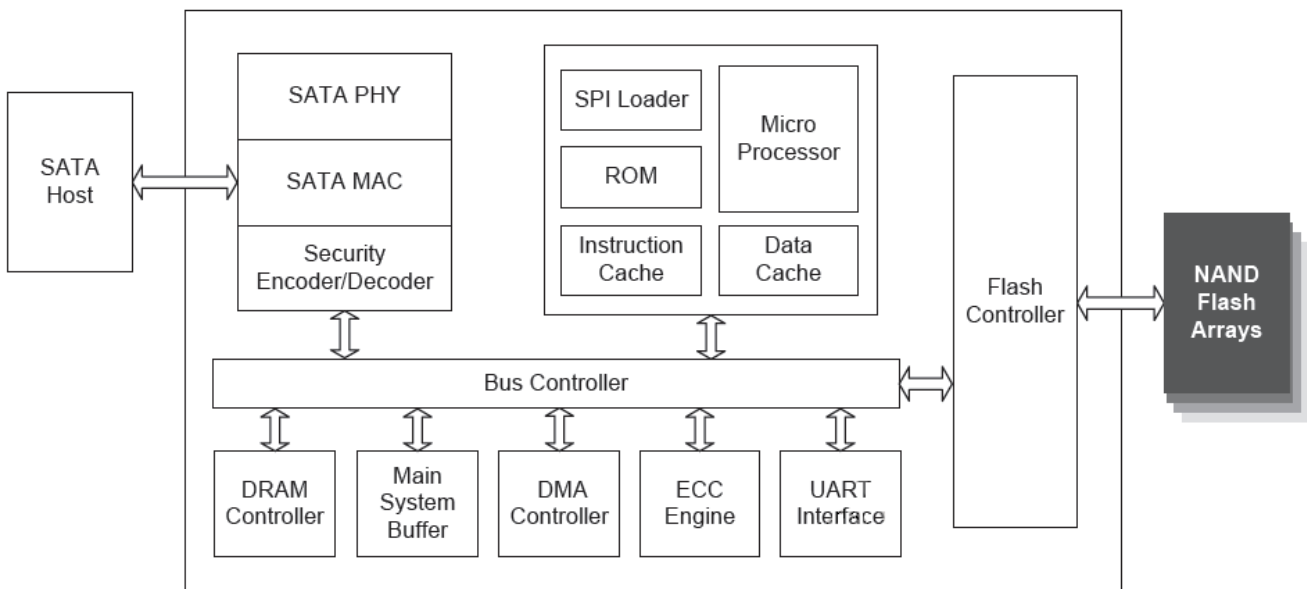


Figure 3: 2.5” SATA SSD Block Diagram

2.2.2. Pin Signal Assignment

The signals assigned for Serial ATA applications are described in Table 4

Group	Pin No.	Function	Description
Signal Segment	S1	GND	Ground
	S2	RX+	Differential signal pair A
	S3	RX-	
	S4	GND	Ground
	S5	TX-	Differential signal pair A
	S6	TX+	
	S7	GND	Ground
Key & Spacing			
Power Segment	P1	NC	No connect on the device side
	P2	NC	No connect on the device side
	P3	NC	No connect on the device side
	P4	GND	Ground
	P5	GND	Ground
	P6	GND	Ground
	P7	V5	5V power input
	P8	V5	5V power input
	P9	V5	5V power input
	P10	GND	Ground
	P11	GND	Ground
	P12	GND	Ground
	P13	NC	No connect on the device side
	P14	NC	No connect on the device side
	P15	NC	No connect on the device side

Table 7: 2.5” SATA SSD connector pin definition

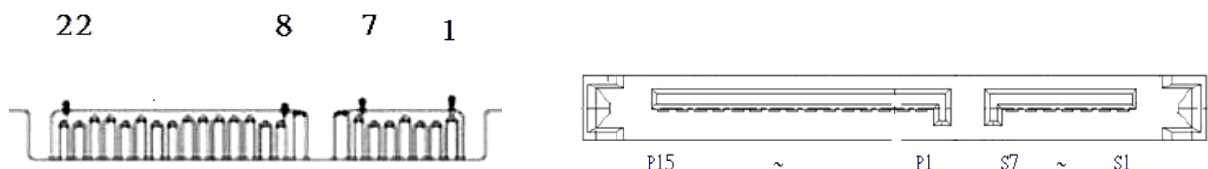


Figure 4: 2.5” SATA SSD Connector Pin Assignment

2.3. Support ATA Commands

ATA Command Set summarizes the ATA command set with the paragraphs that follow describing the individual commands and the task file for each.

Command	Code	Protocol
General Feature Set		
Execute Drive Diagnostic	90h	Device diagnostic
Flush Cache	E7h	Non-data
Identify Device	ECh	PIO data-in
Initialize Drive Parameters	91h	Non-data
Read DMA	C8h	DMA
Read Log Ext	2Fh	PIO data-in
Read Multiple	C4h	PIO data-in
Read Sector(s)	20h	PIO data-in
Read Verify Sector(s)	40h or 41h	Non-data
Set Feature	EFh	Non-data
Set Multiple Mode	C6h	Non-data
Write DMA	CAh	DMA
Write Multiple	C5h	PIO data-out
Write Sector(s)	30h	PIO data-out
NOP	00h	Non-data
Read Buffer	E4h	PIO data-in
Write Buffer	E8h	PIO data-out
Power Management Feature Set		
Check Power Mode	E5h or 98h	Non-data
Idle	E3h or 97h	Non-data
Idle Immediate	E1h or 95h	Non-data
Sleep	E6h or 99h	Non-data
Standby	E2h or 96h	Non-data
Standby Immediate	E0h or 94h	Non-data
Security Mode Feature Set		
Security Set Password	F1h	PIO data-out
Security Unlock	F2h	PIO data-out
Security Erase Prepare	F3h	Non-data
Security Erase Unit	F4h	PIO data-out
Security Freeze Lock	F5h	Non-data
Security Disable Password	F6h	PIO data-out

Command	Code	Protocol
SMART Feature Set		
SMART Disable Operations	B0h	Non-data
SMART Enable/Disable Autosave	B0h	Non-data
SMART Enable Operations	B0h	Non-data
SMART Execute OFF-LINE Immediate	B0h	Non-data
SMART Read Data	B0h	PIO data-in
SMART Read Threshold	B0h	PIO data-in
SMART Return Status	B0h	Non-data
SMART Save Attribute Values	B0h	Non-data
Host Protected Area Feature Set		
Read Native Max Address	F8h	Non-data
Set Max Address	F9h	Non-data
Set Max Set Password	F9h	PIO data-out
Set Max Lock	F9h	Non-data
Set Max Freeze Lock	F9h	Non-data
Set Max Unlock	F9h	PIO data-out
48-bit Address Feature Set		
Flush Cache Ext	EAh	Non-data
Read Sector(s) Ext	24h	PIO data-in
Read DMA Ext	25h	DMA
Read Multiple Ext	29h	PIO data-in
Read Native Max Address Ext	27h	Non-data
Read Verify Sector(s) Ext	42h	Non-data
Set Max Address Ext	37h	Non-data
Write DMA Ext	35h	DMA
Write Multiple Ext	39h	PIO data-out
Write Sector(s) Ext	34h	PIO data-out
NCQ Feature Set		
Read FPDMA Queued	60h	DMA Queued
Write FPDMA Queued	61h	DMA Queued
Others		
Data Set Management	06h	DMA
Seek	70h	Non-data

Table 8: ATA Command List

2.4. Shock & Vibration

Reliability	Test Conditions	Reference Standards
Vibration	10Hz to 2KHz, 20G, 3 axes	IEC 60068-2-6
Mechanical Shock	Duration: 0.5ms, 1500G, 3 axes	IEC 60068-2-27

Table 9: Shock/Vibration Testing for 2.5" SATA SSD

2.5. Error Detection and Correction

The hardware Error Correction Coding (ECC) engine executes parity generation and error detection/ correction features, and enhances decoding throughput and data reliability. with multi-mode correction capability up to 66 bits, the powerful ECC engine is able to support the latest generation NAND.

2.6. Wear-Leveling

Flash memory can be erased within a limited number of times. This number is called the erase cycle limit or write endurance limit and is defined by the flash array vendor. The erase cycle limit applies to each individual erase block in the flash device.

2.7. Bad Blocks Management

Bad Blocks are blocks that contain one or more invalid bits whose reliability are not guaranteed. The Bad Blocks may be presented while the SSD is shipped, or may generate during the life time of the SSD. When the Bad Blocks is detected, it will be flagged, and not be used anymore. The SSD implement Bad Blocks management and replacement, Error Correct Code to avoid data error occurred. The functions will be enabled automatically to transfer data from Bad Blocks to spare blocks, and correct error bit. After the reserved block less than 10 of each channel, the SSD will be locked, and cannot be read and written anymore. Host can send a vendor ATA command to unlock the SSD for backup data or system from SSD.

2.8. Mean Time between Failures (MTBF)

Failure Rate: The total number of failures within an item population, divided by the total number of life units expended by that population, during a particular measurement interval under stated condition.

Mean Time between Failures (MTBF): A basic measure of reliability for repairable items: The mean number of life units during which all parts of the item perform within their specified limits, during a particular measurement interval under stated conditions.

Product	Condition	MTBF (Hours)
2.5" SATA SSD	Telcordia SR-332 GB, 25°C	>2,000,000

Table10: 2.5" SATA SSD MTBF

2.9. Endurance

- Data Retention: 10 years.
- Flash Endurance: MLC: 3,000 P/E Cycle
aMLC: 20,000 P/E Cycle
- Wear-Leveling Algorithm: Support.
- Bad Blocks Management: Support.
- Error Correct Code: Support.

2.10. Transfer Mode

- 2.5" SATA SSD support following transfer mode:
 - Serial ATA I 1.5Gbps
 - Serial ATA II 3.0Gbps
 - Serial ATA III 6.0Gbps