

**Industrial SATAⅢ mSATA
Solid State Drive 3D-TLC
A-Series (Power Shield Type)**

データシート

株式会社アドテック

Revision History

Revision	Description	Date
V1.0	New released	April 2025

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1. Product Description

1.1. Product Overview

ADTEC SATAIII mSATA SSD is the storage device based on NAND flash memory technology. This product complies with Serial ATA standard interface and suitable for data storage media and code storage device for embedded system and boot disk. By using mSATA SSD Module, it is possible to operate good performance for the systems, which have SATA interface. With small form factor, the applicable appliance can add or install SATA storage device on its Mother Board or Complete set.

Another innovative design feature is worth mention is "Power Shield", excellent electronic circuit design provides high efficiency power protection capacitor charging efficiency, when a suddenly power failure can protect the integrity of the data write. ADTEC SATAIII mSATA SSD is the perfect storage device for industrial PCs, Enterprise-Grade Server, Vehicle System, Professional-Grade Photography System.

1.2. Product Features

- Excellent Power Shield function, when a suddenly power failure can protect the integrity of the data write.
- Small form factor refers to the MO-300 specification which established by JEDEC.
- Industrial Standard SATA Revision 3.1 compliant.
- Industrial Standard ATA/ATAPI-8 and ACS-3 command compliant.
- Native Command Queuing up to 32 commands.
- Memory Capacities
3D-TLC: 240GB/ 480GB/ 960GB
- High performance and reliability.
- Support DDR3/DDR3L External DRAM Buffer.
- Build-in Global Wear-leveling and Hardware LDPC ECC engine with hard-decision and soft-decision decoding.
- 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.
- Supports 28-bit and 48-bit LBA(Logical Block Addressing) mode commands.
- Supports S. M. A. R. T. & Trim command.
- Supports SATA device sleep mode(DevSleep).
- Noiseless and stable installation to system.
- Resistant to shock and vibration.
- Supports Bad Block Management.
- Supports Garbage Collection.
- Fully Compliant with RoHS directive.
- CE and FCC Compatibility

1.3. Specifications

Interface	SATAIII 6Gb/s compatible
NAND Flash Type	3D-TLC
Controller	SM2259H
Form Factor	MO-300
Connector Type	mSATA (52 pin)
External DRAM Buffer	Yes
Capacity	240GB / 480GB / 960GB
Power Consumption (Max)	Idle: 0.417W, Active: 2.461W
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
Power Shield Function	Yes
TRIM	Yes
S.M.A.R.T (Health Monitor)	Yes
Vibration (Operating)	20GPeak, 7 ~ 2000Hz
Shock	1500G,0.5ms
Dimension (L x W x H)	50.8 x 29.85 x 3.83mm

Table 1: mSATA SSD Specifications

1.4. Performance

Capacity	240GB	480GB	960GB
Sequential Read(Max)	535MB/sec	560MB/sec	560MB/sec
Sequential Write(Max)	355MB/sec	360MB/sec	400MB/sec

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

Table 2: mSATA SSD Performance

1.5. TBW (Tera Bytes Written)

Capacity	TBW
240GB	384TB
480GB	769TB
960GB	1538TB

Table 3: mSATA SSD TBW

1.6. System Requirement

The Host system which is connected to mSATA SSD should meet system requirements at minimum.

1.6.1. Supply Voltage

Item	Symbol	Rating	Unit
Input voltage	VIN	+3.3DC \pm 5%	V

Table 4: mSATA SSD Supply Voltage

1.6.2. Operating System

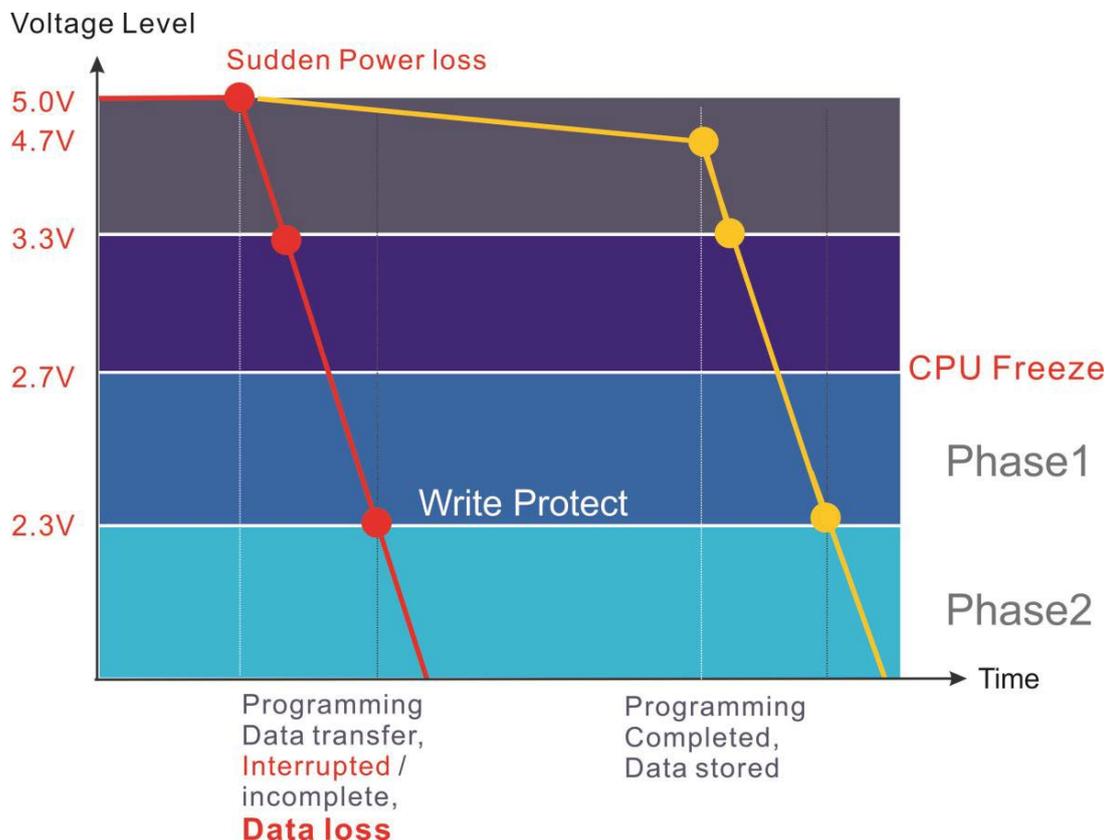
- Windows family.
- Linux family.
- DOS or embedded system.

1.6.3. Interface

- miniPCIe Interface.

1.6.4. Power Shield Function

Excellent Power Shield function, when a suddenly power failure can protect the integrity of the data write.



2. Detailed Specification

2.1. Physical Specifications

2.1.1. Overview

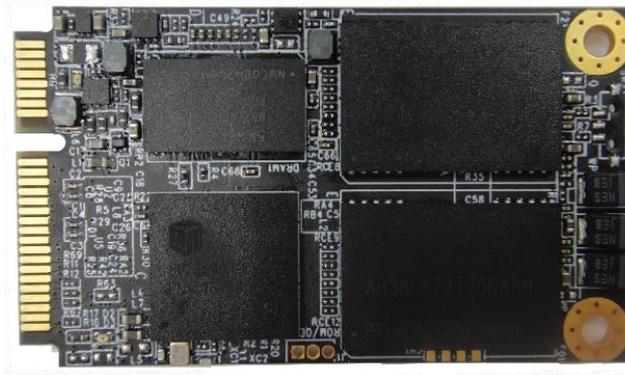


Figure 1: mSATA SSD Overview Diagram

2.1.2. Dimension

The Dimensions of mSATA SSD are illustrated in Figure 2 and described in Table 4.

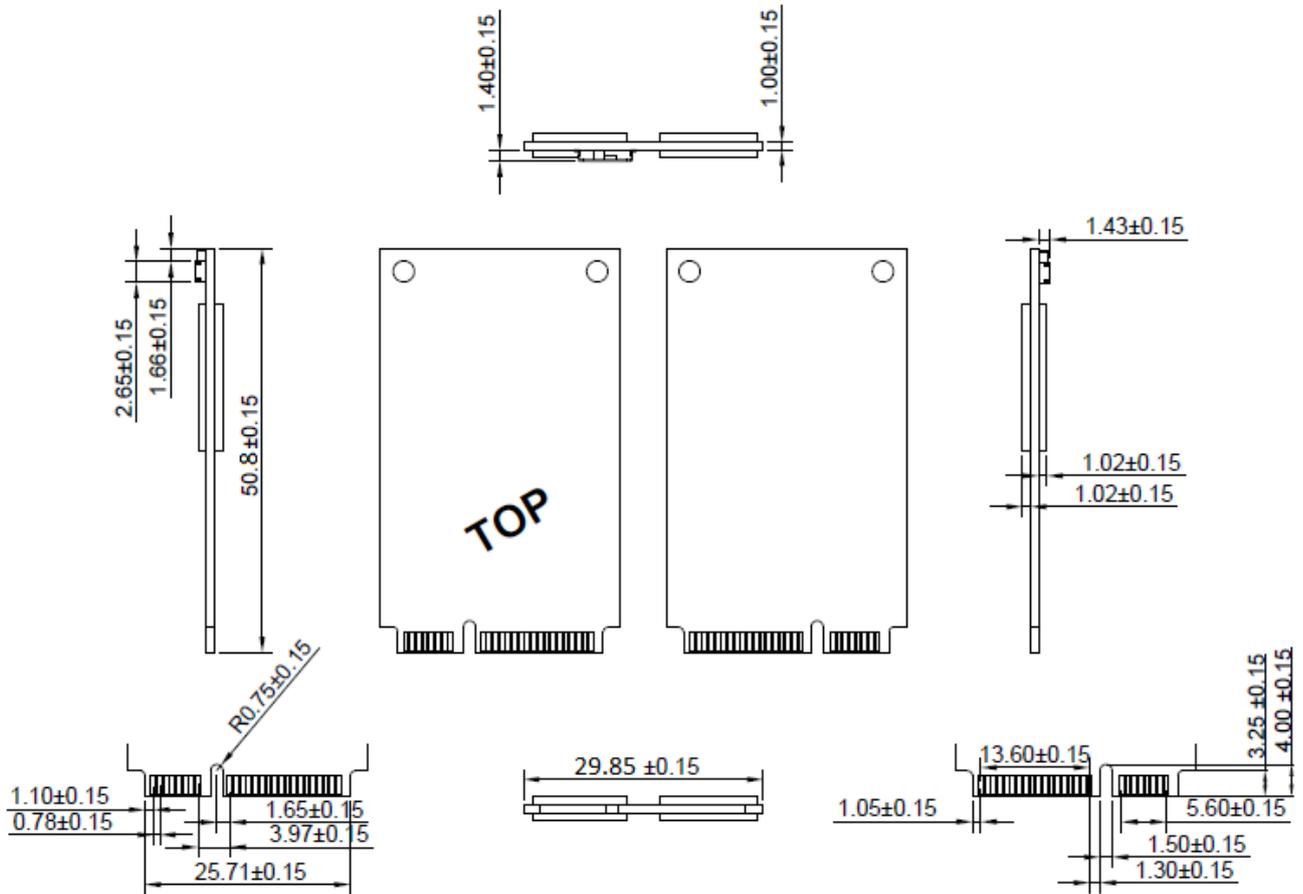


Figure 2: mSATA SSD Module Dimensions

Parameter	Specifications
Width	29.85mm ± 0.15mm
Length	50.8mm ± 0.15mm
Height	3.83mm ± 0.15mm

Table 4: mSATA SSD Module Physical Dimension

2.2. Electronic Specifications

2.2.1. Product Definition

mSATA SSD Module 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.

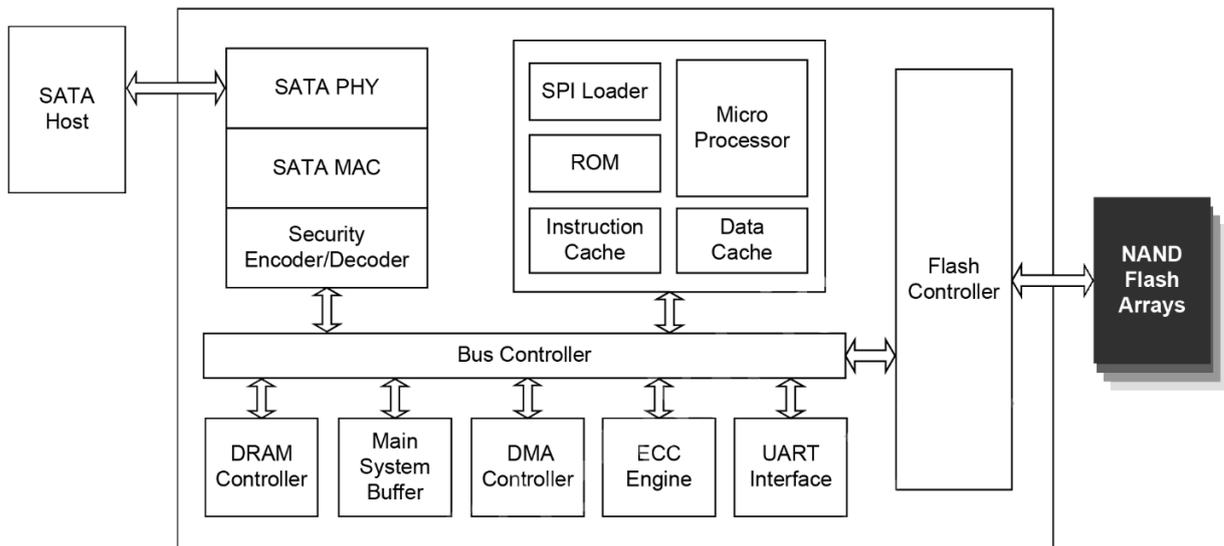


Figure 3: mSATA SSD Block Diagram

2.2.2. Pin Signal Assignment

The signals assigned for Serial ATA applications are described in Table 5

Pin definition	Pin No.
GND	4,9,15,18,21,26,27,29,34,35,37,40,43,50
3V3 power+in	2,24,39,41,52
SATA Txn	25
SATA Txp	23
SATA Rxn	31
SATA Rxp	33
Presence Detection	51
DA/DSS	49

Table 5: mSATA SSD connector pin definition

Signal Name	Pin #	Pin #	Signal Name
Presence Detection	51	52	+3.3V
DA/DSS	49	50	GND
NC	47	48	NC
NC	45	46	NC
GND	43	44	NC
+3.3V	41	42	NC
+3.3V	39	40	GND
GND	37	38	NC
GND	35	36	NC
+A – RX-	33	34	GND
-A – RX-	31	32	NC
GND	29	30	NC
GND	27	28	NC
-B – TX-	25	26	GND
+B – TX-	23	24	+3.3V
GND	21	22	NC
NC	19	20	NC
NC	17	18	GND
GND	15	16	NC
NC	13	14	NC
NC	11	12	NC
GND	9	10	NC
NC	7	8	NC
NC	5	6	NC
NC	3	4	GND
NC	1	2	+3.3V



Figure 4: mSATA 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 6: ATA Command List

2.4. Shock & Vibration

Reliability	Test Conditions	Reference Standards
Vibration	7Hz to 2KHz, 20G, 3 axes	IEC 60068-2-6
Mechanical Shock	Duration: 0.5ms, 1500G, 3 axes	IEC 60068-2-27

Table 7: Shock/Vibration Testing for mSATA SSD

2.5. Error Detection and Correction

The LDPC ECC engine executes parity generation and error detection/correction features, and enhances decoding throughput and data reliability. With LDPC of correction capability 1e-2 RBER, the hard and soft decoding mechanism provides powerful error correction. Hence the SSD can enhance the endurance and retention of TLC NAND and extends the SSD lifespan.

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.

mSATA uses a static wear-leveling algorithm to ensure that consecutive writes of a specific sector are not written physically to the same page/block in the flash. This spreads flash media usage evenly across all pages, thereby extending flash lifetime.

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)
mSATA SSD	Telcordia SR-332 GB, 25°C	>2,000,000

Table8: mSATA SSD MTBF

2.9. Endurance

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

2.10. Transfer Mode

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

3. Installation Requirements

3.1. mSATA Pin Directions

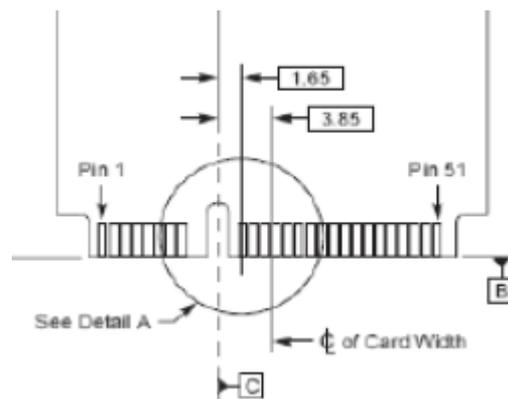


Figure 5: Signal Segment and Power Segment

3.2. Electrical Connections for mSATA

A Serial ATA device may be either directly connected to a host or connected to a host through a cable. For connection via cable, the cable should be no longer than 1 meter. The SATA interface has a separate connector for the power supply. Please refer to the pin description for further details.

3.3. Device Drive

No additional device drives are required. The mSATA can be configured as a boot device.

4. Ordering Information

P/N	Capacity	Remark
ADOSS3240G3TESNCJ	240GB	KIOXIA 3D-TLC BiCS 5 Normal Temp.
ADOSS3480G3TESNCJ	480GB	
ADOSS3960G3TESNCJ	960GB	
ADOSS3240G3TESWCJ	240GB	KIOXIA 3D-TLC BiCS 5 Wide Temp.
ADOSS3480G3TESWCJ	480GB	
ADOSS3960G3TESWCJ	960GB	