

Industrial SATAⅢ M.2(2242)
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	December, 2018

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1. Product Description

1.1. Product Overview

'ADTEC M.2 SATA 2242 series' with 6.0 Gb/s SATA interface is the next generation form factor M.2's more flexible specification allows for different module widths and lengths, and with advanced interfacing features, makes the M.2 form factor more suitable for NAND flash Solid State Drive (SSD) applications in general.

'ADTEC M.2 SATA 2242 series' allows for length dimension of 80mm and its interface make it a perfect choice for small hand held and miniaturized devices.

For certain embedded applications where space is limited, 'ADTEC M.2 SATA 2242 series' specifications provide for different thicknesses of M.2 SSDs single-sided versions and dual-sided versions.

At the same time, 'ADTEC M.2 SATA 2242 series' is able to deliver exceptional read/write speeds, making it ideal for use in heavy-loading or multi-tasking applications.

'ADTEC M.2 SATA 2242 series' data is protected by built in 66 bits per 1KB Error Correction Code (ECC).

'ADTEC M.2 SATA 2242 series' has intelligent controller manages interface protocols, data storage and retrieval, defect handling and diagnostics, power saving modes, wear leveling and flash block management.

1.2. Product Features

- 100% Test for Reliability
- 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.
- Support data security erase and quick erase.
- Internal data shaping technique increases data endurance.
- Memory Capacities
 - MLC : 64GB / 128GB / 256GB
 - aMLC : 32GB / 64GB / 128GB
- SATA Device sleep (DevSleep).
- 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	M.2 (NGFF) 2242
Connector Type	SATA (75 pin)
External DRAM Buffer	Yes
Capacity	MLC: 64GB ~ 256GB aMLC: 32GB ~ 128GB
Power Consumption (Max)	Idle: 0.346W, Active: 2.24W
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)	Single Sided:42 x 22 x 2.15mm Dual Sided: 42 x 22 x 3.5mm

Table 1: M.2 SATA SSD Specifications

1.4. Performance

MLC

Capacity	64GB	128GB	256GB
Sequential Read(Max)	440MB/sec	476MB/sec	460MB/sec
Sequential Write(Max)	70MB/sec	140MB/sec	320MB/sec

aMLC

Capacity	32GB	64GB	128GB
Sequential Read(Max)	250MB/sec	480MB/sec	480MB/sec
Sequential Write(Max)	45MB/sec	88MB/sec	162MB/sec

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

Table 2: M.2 SATA SSD Performance

1.5. TBW (Tera Bytes Written)

Capacity	TBW(MLC)	TBW(aMLC)
32GB	—	320TB
64GB	96TB	641TB
128GB	192TB	1282TB
256GB	384TB	—

Table 3: M.2 SATA SSD TBW

1.6. System Requirement

The Host system which is connected to M.2 SATA SSD should meet system requirements at minimum.

1.6.1. Supply Voltage

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

Table 4: M.2 SATA SSD Supply Voltage

1.6.2. Power Consumption

Item	Rating
Idle (Max.)	0.346W (3.3V *105mA)
Active (Max.)	2.24W (3.3V *680mA)

Table 5: M.2 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

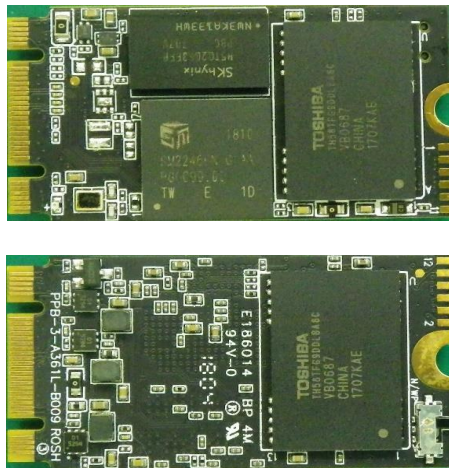


Figure 1: M.2 SATA SSD Overview Diagram

2.1.2. Dimension

The Dimensions of M.2 SATA SSD are illustrated in Figure 2 and described in Table 6.

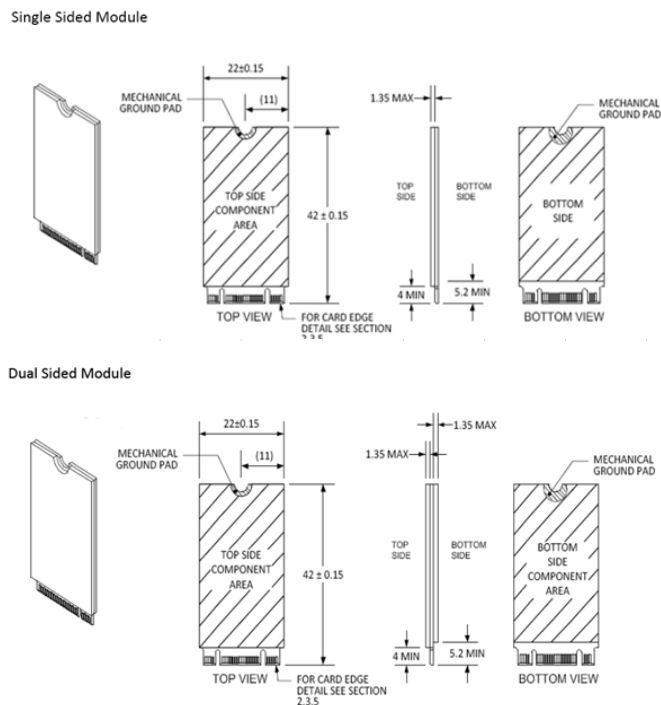


Figure 2: M.2 SATA SSD Module Dimensions

Parameter	Specifications
Width	22.0mm
Length	42.0mm
Height	Single-Sided : 2.15mm / Dual-Sided : 3.5mm

Table 6: M.2 SATA SSD Module Physical Dimension

2.2. Electronic Specifications

2.2.1. Product Definition

M.2 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.

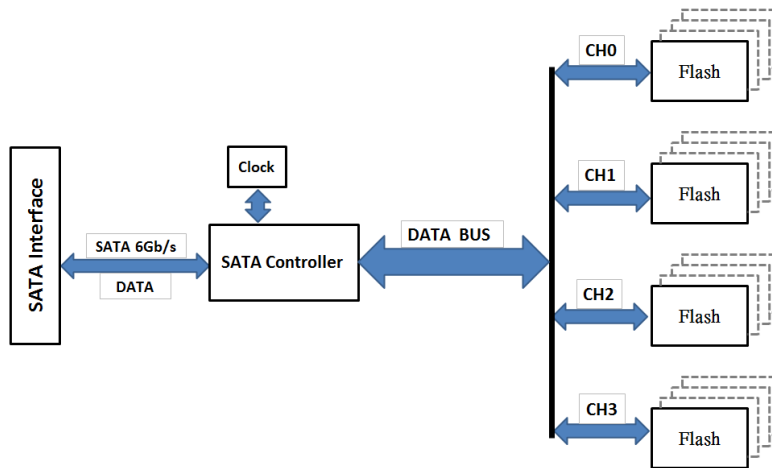


Figure 3: M.2 SATA SSD Block Diagram

2.2.2. Pin Signal Assignment

The signals assigned for Serial ATA applications are described in Table 7.

PIN#	Function	Function	PIN#
74	3.3V	CONFIG_2=GND	75
72	3.3V	GND	73
70	3.3V	GND	71
68	N/C	CONFIG_1=GND	69
	Module Key	N/C	67
	Module Key	Module Key	
	Module Key	Module Key	
	Module Key	Module Key	
	Module Key	Module Key	
58	N/C	GND	57
56	N/C	N/C	55
54	N/C	N/C	53
50	N/C	GND	51
48	N/C	SATA B+	49
46	N/C	SATA B-	47
44	N/C	GND	45
42	N/C	SATA A-	43
40	N/C	SATA A+	41
38	DEVSLP(I)(O/3.3V)	GND	39
36	N/C	N/C	37
34	N/C	N/C	35
32	N/C	GND	33
30	N/C	N/C	31
28	N/C	N/C	29
26	N/C	GND	27
24	N/C	N/C	25
22	N/C	N/C	23
20	N/C	CONFIG_0=GND	21
	Module Key	Module Key	
	Module Key	Module Key	
	Module Key	Module Key	
	Module Key	Module Key	
10	DAS/DSS#(I/O)	N/C	11
8	N/C	N/C	9
6	N/C	N/C	7
4	3.3V	N/C	5
2	3.3V	GND	3
		CONFIG_3=GND	1

Table 7: M.2 SATA SSD connector pin definition

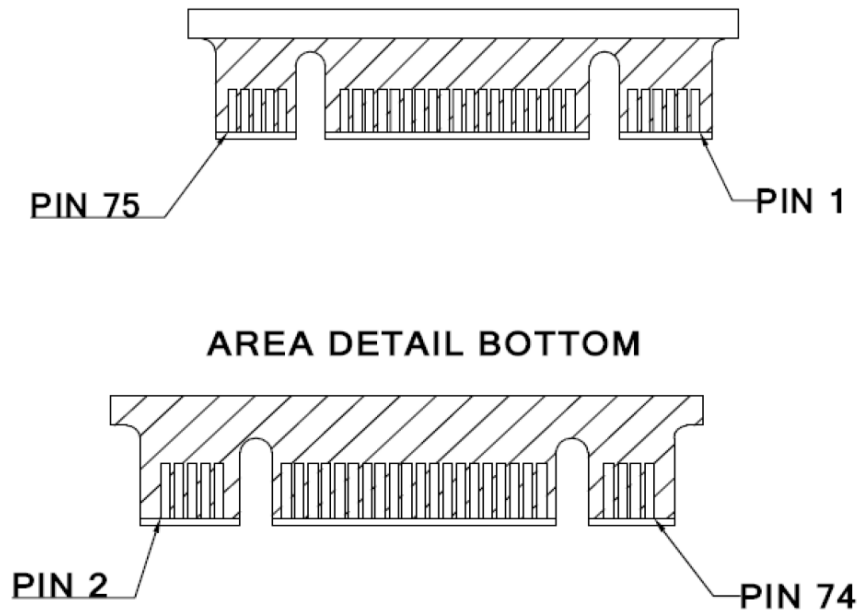


Figure 4: M.2 SATA SSD Connector Pin Assignment

2.3. SMART Attributes

The following table defines the vender specific data in bytes 2 to 361 of the 512-byte SMART data.

Attribute ID	Raw Attribute Value						Attribute Name
0x01	MSB	0	0	0	0	0	Read error rate
0x05	LSB	MSB	0	0	0	0	Reallocated sectors count
0x09	LSB			MSB	0	0	Reserved
0x0C	LSB			MSB	0	0	Power cycle count
0xA0	LSB			MSB	0	0	Uncorrectable sector count when read/write
0xA1	LSB	MSB	0	0	0	0	Number of valid spare block
0xA2	LSB	MSB	0	0	0	0	Number of cache data block
0xA3	LSB	MSB	0	0	0	0	Number of initial invalid block
0xA4	LSB			MSB	0	0	Total erase count
0xA5	LSB			MSB	0	0	Maximum erase count
0xA6	LSB			MSB	0	0	Minimum erase count
0xA7	LSB			MSB	0	0	Average erase count
0xC0	LSB			MSB	0	0	Power-off retract count
0xC2	MSB	0	0	0	0	0	Controlled temperature
0xC3	LSB			MSB	0	0	Hardware ECC recovered
0xC4	LSB			MSB	0	0	Reallocation event count
0xC7	LSB	MSB	0	0	0	0	Ultra DMA CRC error count
0xF1	LSB			MSB	0	0	Total LBAs written (each write unit = 32MB)
0xF2	LSB			MSB	0	0	Total LBAs read (each read unit = 32MB)

Table 8: SMART Attributes

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 9: Shock/Vibration Testing for M.2 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)
M.2 SATA SSD	Telcordia SR-332 GB, 25°C	>2,000,000

Table 10: M.2 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

- M.2 SATA SSD support following transfer mode:
 - Serial ATA I 1.5Gbps
 - Serial ATA II 3.0Gbps
 - Serial ATA III 6.0Gbps

3. Ordering Information

P/N	Capacity	Flash	Type	Temp
C2464GMCTJFSVG	64GB	Toshiba-15nm	MLC	Normal-Temp
C2412GMCTKFSVG	128GB			
C2425GMCTKFSVG	256GB			
C2464GMICTJFSVG	64GB	Toshiba-15nm	MLC	Wide-Temp
C2412GMITKFSVG	128GB			
C2425GMITKFSVG	256GB			
C2432GACTJFSVG	32GB	Toshiba-15nm	aMLC	Normal-Temp
C2464GACTKFSVG	64GB			
C2412GACTKFSVG	128GB			
C2432GAITJFSVG	32GB	Toshiba-15nm	aMLC	Wide-Temp
C2464GAITKFSVG	64GB			
C2412GAITKFSVG	128GB			