



# **M.2 2242 SATA SSD**

**IM2S3334**

**64GB 、 128GB 、 256GB 、 512GB**

**Product Datasheet**

**Version 0**



## Revision History

Revision	Date	Description	Editor
0	Apr.30.2019	Modify PE CYCLE 3K Information	Terry Chu



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## Key Features:

- **Capacity:** 64GB, 128GB, 256GB, 512GB
- **NAND Flash:** 3D TLC
- **Form Factor:** M.2 2242
- **Compatibility:**
  - Serial ATA 6Gb/s interface
  - Complies with ATA-8 Standard
  - Complies SATA Revision 3.1
  - S.M.A.R.T feature supported
  - NCQ Command set supported
  - TCG OPAL 2.0 (Option)
  - AES 256 (Option)
- **Performance**
  - Sequential Read:  
Up to 560MB/s
  - Sequential Write:  
Up to 520MB/s
  - Random 4K Read:  
Up to 85,000
  - Random 4K Write:  
Up to 74,000
- **Power Consumption:** (Typical)
  - Slumber: 0.04W
  - Active: 0.42W
  - Device sleep : 4.2mW
  - SR/SW : 1.7W/2.3W
  - RR/RW: 2.0W/1.7W
- **Temperature:**
  - Operation: 0°C ~ 70°C ( Normal )
  - Operation: -40°C ~ 85°C( Wide )
  - Non-operation: -55°C ~ 95°C
- **Reliability**
  - Shock: 1500G/0.5ms
  - Vibration 20G Peak, 10~2000Hz
  - MTBF: 2,000,000 hours
  - TBW : 1040 TB
  - DWPD : 1.8



## 1.0 General Description

Taking the advantages of NAND flash memory, Solid State Drive (SSD) provides better solutions on durability, performance, and power efficiency over traditional hard disk drives. Employing static wear-leveling technology to maximize device mean time between failures (MTBF), The SSD solutions are your best choice on wide-ranged mobile computing devices and consumer electronic products. With standard SATA form factor or customized module form factor, The M.2 2242 ADATA SSD IM2S3334 offers capacities 64GB~512GB using 3D TLC NAND type flash memories.

## 2.0 Mechanical Specification

”All product specifications not covered in this document (electrical performance, appearance, etc.) are in accordance with ADATA’s defined norms and standards. “

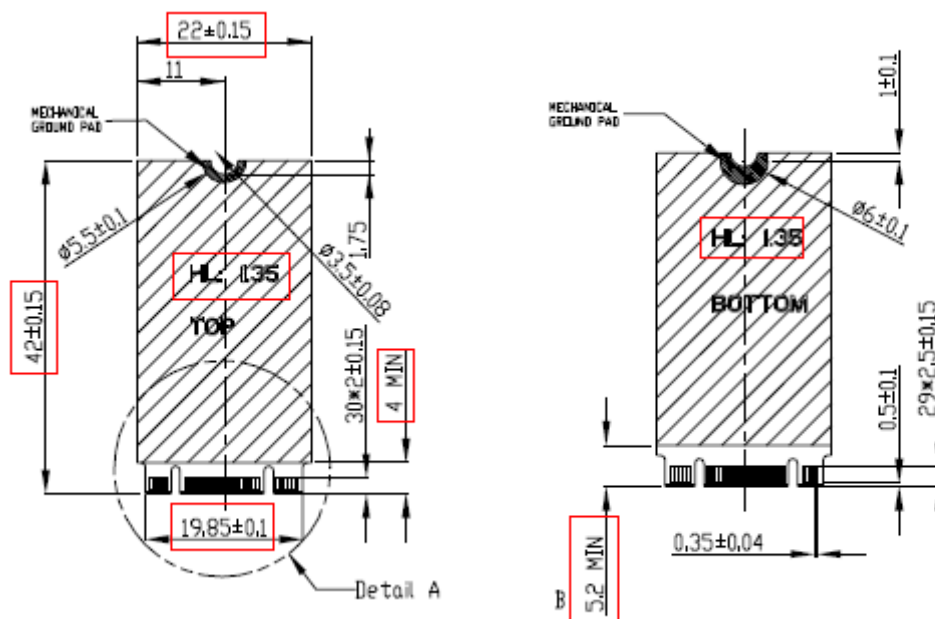
### 2.1 Physical dimensions and Weight

Table 2-1 Dimensions and Weight

Model	Length(mm)	Width(mm)	Height(mm)	Weight(gram)
64GB	42.00+/-0.15	22.00+/-0.15	Max 3.5	Max 10
128GB	42.00+/-0.15	22.00+/-0.15	Max 3.5	Max 10
256GB	42.00+/-0.15	22.00+/-0.15	Max 3.5	Max 10
512GB	42.00+/-0.15	22.00+/-0.15	Max 3.5	Max 10

## 2.2 Product Dimensions

Figure 2-1 Product Dimensions



## 3.0 Product Specification

### 3.1 Interface and configuration

- Supports 1-port 1.5/3.0/6.0 Gbps SATA I/II/III interface.
- Compliant with Serial ATA International Organization: Serial ATA Revision 3.1.
- Compliant SSD Alliance compliance program.

## 3.2 Capacity

**Table 3-1 User Addressable Sectors**

<b>Model</b>	<b>IM2S3334</b>			
Unformatted Capacity	64GB	128GB	256GB	512GB
Total User Addressable Sectors (LBA Mode)	125,045,424	250,069,680	500,118,192	1,000,215,216

Total useable capacity may be less (due to formatting, flash management, and other functions).  
1GB=1,000,000,000 bytes; 1sector = 512bytes.

## 3.3 Performance

### 3.3.1 Read/Write & ATTO Performance

**Table 3-2 Read/Write Performance (ATTO)**

<b>TLC</b>	<b>64GB</b>	<b>128GB</b>	<b>256GB</b>	<b>512GB</b>	<b>Unit</b>
<b>Sequential Read</b>	400	560	560	560	MB/s
<b>Sequential Write</b>	65	350	500	520	MB/s

-Seq. Read & Write speed test by ATTO  
-The system conditions and test environment may affect test result

### 3.3.2 Read/Write & CDM Performance

**Table 3-3 Read/Write Performance (CDM)**

<b>TLC</b>	<b>64GB</b>	<b>128GB</b>	<b>256GB</b>	<b>512GB</b>	<b>Unit</b>
<b>Sequential Q32 Read</b>	400	560	560	560	MB/s
<b>Sequential Q32 Write</b>	65	350	500	520	MB/s

-Seq. Read & Write speed test by Crystal Disk Mark 5.1.2

### 3.3.3 IOPS Performance

**Table 3-4 Read/Write & IOPS Performance**

<b>TLC</b>	<b>64GB</b>	<b>128GB</b>	<b>256GB</b>	<b>512GB</b>	<b>Unit</b>
<b>4K Random Read</b>	29K	51K	80K	85K	IOPS
<b>4K Random Write</b>	16K	33K	64K	74K	IOPS



- Seq. Read & Write speed test by IOmeter 2010 with "00" pattern (Queue depth of 32; Measurements are performed on 10% capacity of LBA range. Write cache enable)
- IOPS Test Utility: IOmeter 2010 (Queue depth of 32; Measurements are performed on 10% capacity of LBA range. Write cache enable)
- The system conditions and test environment may affect test result

### 3.3.4 Read/Write & AS-SSD Performance

**Table 3-5 Read/Write Performance (AS-SSD)**

TLC	64GB	128GB	256GB	512GB	Unit
<b>Sequential Read</b>	372	530	529	523	MB/s
<b>Sequential Write</b>	64	231	302	459	MB/s
<b>4K-64 Thrd Read</b>	92	180	323	339	MB/s
<b>4K-64 Thrd Write</b>	64	109	294	331	MB/s

-Seq. Read & Write speed test by AS-SSD with Random pattern

## 3.4 Electrical

### 3.4.1 Operating Voltage

**Table 3-6 Operating Voltage**

Operating Voltage	
<b>Input Power</b>	DC 3.3V ± 10%
<b>Maximum Ripple</b>	100mV p-p or less

### 3.4.2 Power Consumption (Typical)

TLC	64GB	128GB	256GB	512GB	Unit
<b>Slumber</b>	0.04	0.04	0.04	0.04	W
<b>Active</b>	0.39	0.39	0.42	0.42	
<b>Sequential Read</b>	1.6	1.6	1.7	1.7	
<b>Sequential Write</b>	1.6	1.5	1.9	2.3	
<b>Random Read</b>	1.85	1.7	1.7	2.0	
<b>Random Write</b>	1.6	1.5	1.7	1.7	
<b>DevsIp</b>	4.1	4.1	4.1	4.2	mW

**Table 3-7 Power Consumption (Typical)**

To measure consumption in /Slumber/ Active mode and Sequential Read/Write and Random Read/Write



### 3.5 Environmental Conditions

**Table 3-8 Temperature, Humidity, Shock, Vibration**

Feature	Operating	Non-Operating
Normal Temperature	0°C to 70°C	-55°C to 95°C
Wide Temperature	-40°C to 85°C	-55°C to 95°C
Humidity	5%~95%	5%~95%
Vibration	20G Peak, 10~2000Hz	
Shock	1500G, duration 0.5ms, Half Sine Wave	

### 3.6 Reliability

#### 3.6.1 Reliability

**Table 3-9 Reliability Specification**

Parameter	Estimate Value
<b>Mean Time Between Failures (MTBF)</b> The MTBF statistics were calculated by Part Count Method, not relevant to individual units	2,000,000 hours

### 3.7 Endurance

Endurance for the SSD can be predicted based on the operating workload. The tables as below shows the drive lifetime for each SSD capacity based JESD219A Client workload.

**[Table 3-10] Tera Byte Written**

TLC	64GB	128GB	256GB	512GB	Unit
TBW	130	260	520	1040	TB

## 4.0 Supported Command Sets

### 4.1 Identify Controller

ADATA IM2S3334 responds to IDENTIFY Controller command with a pre-defined string of information on features, hardware and firmware revision information, and functionality support indicators.

**[Table 4-1] Supported ATA Command Table**

<b>Bytes</b>	<b>Description</b>
0	General configuration
1	Default number of cylinders
2	Reserved
3	Default number of heads
4	Obsolete
5	Obsolete
6	Default number of sectors per track
7 - 8	Number of sectors per card (Word 7 = MSW, Word 8 = LSW)
9	Obsolete
10 - 19	Serial number in ASCII (Right justified)
20	Obsolete
21	Obsolete
22	Obsolete
23 - 26	Firmware revision in ASCII Big Endian Byte Order in Word
27 - 46	Model number in ASCII (Left justified) Big Endian Byte Order in Word
47	Maximum number of sectors on Read/Write Multiple command
48	Reserved
49	Capabilities
50	Capabilities
51	PIO data transfer cycle timing mode
52	Obsolete
53	Field validity

Bytes	Description
54	Current numbers of cylinders
55	Current numbers of heads
56	Current sectors per track
57 - 58	Current capacity in sectors (LBAs) (Word 57 = LSW , Word 58 = MSW)
59	Multiple sector setting
60 - 61	Total number of user addressable logical sectors for 28-bit commands (DWord)
62	Reserved
63	Multiword DMA transfer Supports MDMA mode 0, 1 and 2
64	Advanced PIO modes supported
65	Minimum Multiword DMA transfer cycle time per word
66	Recommended Multiword DMA transfer cycle time
67	Minimum PIO transfer cycle time without flow control
68	Minimum PIO transfer cycle time with IORDY flow control
69	Additional supported
70 - 74	Reserved
75	Queue depth
76	Serial ATA capabilities <ul style="list-style-type: none"> <li>• Supports Serial ATA Gen3</li> <li>• Supports Serial ATA Gen2</li> <li>• Supports Serial ATA Gen1</li> <li>• Supports Phy event counters log</li> <li>• Supports receipt of host initiated power management requests</li> <li>• Supports Native Command Queuing</li> </ul>
77	Serial ATA additional capability <ul style="list-style-type: none"> <li>• DevSleep_to_ReducedPwerState</li> </ul>
78	Serial ATA features supported <ul style="list-style-type: none"> <li>• Supports Device Sleep</li> <li>• Supports software settings preservation</li> <li>• Device supports initiating power management</li> </ul>
79	Reserved

<b>Bytes</b>	<b>Description</b>
80	Major version number (ACS-3)
81	Minor version number
82	Command sets supported 0
83	Command sets supported 1
84	Command sets supported 2
85 - 87	Command set/feature enabled
88	Ultra DMA mode supported and selected
89	Time required for a Normal Erase mode Security Erase Unit command
90	Time required for an Enhanced Erase mode Security Erase Unit command
91	Current advanced power management value
92	Master password identifier
93 - 99	Reserved
100 - 103	Maximum user LBA for 48-bit address feature set
104	Reserved
105	Maximum number of 512-byte blocks per Data Set Management command
106 - 127	Reserved
128	Security status
129 - 159	Vendor specific
160	Power requirement description
161	Reserved
162	Key management schemes supported
163	CF Advanced True IDE Timing mode capability and setting
164 - 168	Reserved
169	Data Set Management supported
170 - 216	Reserved
217	Non-rotating media (SSD)
218 - 221	Reserved
222	Transport major revision (SATA Rev 3.1)
223 - 254	Reserved
255	Integrity word

## 4.2 Identify Device

ADATA IM2S3334 responds to ATA IDENTIFY DEVICE command with a pre-defined string of information on features, hardware and firmware revision information.

[Table 4-2] Identify Device Table

Word	F / V	Default Value	Description
0	F	0040h	General configuration
1	X	XXXXh	Default number of cylinders
2	V	0000h	Reserved
3	X	00XXh	Default number of heads
4	X	0000h	Obsolete
5	X	0240h	Obsolete
6	F	XXXXh	Default number of sectors per track
7 - 8	V	XXXXh	Number of sectors per card (Word 7 = MSW, Word 8 = LSW)
9	X	0000h	Obsolete
10 - 19	F	XXXXh	Serial number in ASCII (Right justified)
20	X	0002h	Obsolete
21	X	0002h	Obsolete
22	X	0000h	Obsolete
23 - 26	F	XXXXh	Firmware revision in ASCII Big Endian Byte Order in Word
27 - 46	F	XXXXh	Model number in ASCII (Left justified) Big Endian Byte Order in Word
47	F	8001h	Maximum number of sectors on Read/Write Multiple command
48	F	0000h	Reserved
49	F	0F00h	Capabilities
50	F	4000h	Capabilities
51	F	0200h	PIO data transfer cycle timing mode
52	X	0000h	Obsolete
53	F	0007h	Field validity
54	X	XXXXh	Current numbers of cylinders
55	X	XXXXh	Current numbers of heads
56	X	XXXXh	Current sectors per track

57 - 58	X	XXXXh	Current capacity in sectors (LBAs) (Word 57 = LSW , Word 58 = MSW)
59	F	0101h	Multiple sector setting
60 - 61	F	XXXXh	Total number of user addressable logical sectors for 28-bit commands (DWord)
62	X	0000h	Reserved
63	F	0207h	Multiword DMA transfer Supports MDMA mode 0, 1 and 2
64	F	0003h	Advanced PIO modes supported
65	F	0078h	Minimum Multiword DMA transfer cycle time per word
66	F	0078h	Recommended Multiword DMA transfer cycle time
67	F	0078h	Minimum PIO transfer cycle time without flow control
68	F	0078h	Minimum PIO transfer cycle time with IORDY flow control
69	F	4000h	Additional supported
70 - 74	F	0000h	Reserved
75	F	001Fh	Queue depth
76	F	070Eh	Serial ATA capabilities <ul style="list-style-type: none"> <li>• Supports Serial ATA Gen3</li> <li>• Supports Serial ATA Gen2</li> <li>• Supports Serial ATA Gen1</li> <li>• Supports Phy event counters log</li> <li>• Supports receipt of host initiated power management requests</li> <li>• Supports Native Command Queuing</li> </ul>
77	F	0080h	Serial ATA additional capability <ul style="list-style-type: none"> <li>• DevSleep_to_ReducedPwerState</li> </ul>
78	F	0148h	Serial ATA features supported <ul style="list-style-type: none"> <li>• Supports Device Sleep</li> <li>• Supports software settings preservation</li> <li>• Device supports initiating power management</li> </ul>
79	V	0040h	Reserved
80	F	03F0h	Major version number (ACS-2)

81	F	0000h	Minor version number
82	F	742Bh	Command sets supported 0
83	F	7500h	Command sets supported 1
84	F	4023h	Command sets supported 2
85 - 87	V	XXXXh	Command set/feature enabled
88	V	007Fh	Ultra DMA mode supported and selected
89	F	0003h	Time required for a Normal Erase mode Security Erase Unit command
90	F	0001h	Time required for an Enhanced Erase mode Security Erase Unit command
91	V	0000h	Current advanced power management value
92	V	FFFEh	Master password identifier
93 - 99	V	0000h	Reserved
100 - 103	V	XXXXh	Maximum user LBA for 48-bit address feature set
104	V	0000h	Reserved
105	F	0100h	Maximum number of 512-byte blocks per Data Set Management command
106 - 127	V	0000h	Reserved
128	V	0001h	Security status
129 - 159	X	XXXXh	Vendor specific
160	F	0000h	Power requirement description
161	X	0000h	Reserved
162	F	0000h	Key management schemes supported
163	F	0000h	CF Advanced True IDE Timing mode capability and setting
164 - 168	V	0000h	Reserved
169	F	0001h	Data Set Management supported
170 - 216	V	XXXXh	Reserved
217	F	0001h	Non-rotating media (SSD)
218 - 221	X	0000h	Reserved
222	F	107Fh	Transport major revision (SATA Rev 3.1)
223 - 254	X	0000h	Reserved
255	X	XXXXh	Integrity word

**Notes:**

1. F = content (byte) is fixed and does not change.
2. V = content (byte) is variable and may change depending on the state of the device or the commands executed by the device.
3. X = content (byte) is vendor specific and may be fixed or variable.

### 4.3 SMART Attribute

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

[Table 4-3] S.M.A.R.T. Attribute

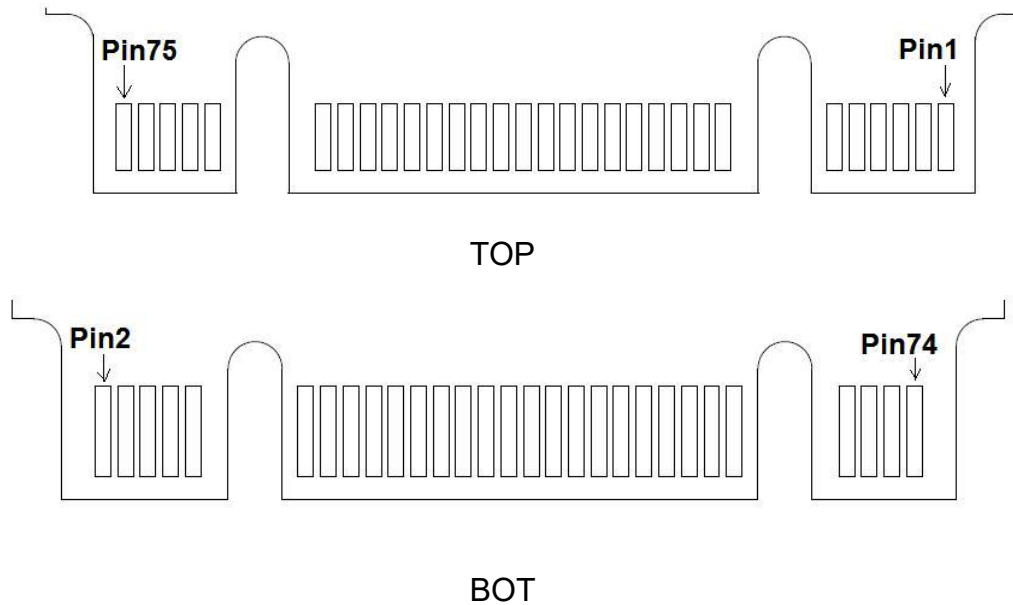
Attribute ID (hex)	Attribute Name
0x01	Read Error Rate
0x05	Reallocated Sectors Count
0x09	Power On Hours
0x0C	Power Cycle Count
0xA0	Uncorrectable Sector Count On Line
0xA1	Number of Pure Spare
0xA3	Number of Initial Invalid Block
0x94	SLC Total Erase Count
0x95	SLC Max Erase Count
0x96	SLC Min Erase Count
0x97	SLC Average Erase Count
0xA4	TLC Total Erase Count
0xA5	TLC Max Erase Count
0xA6	TLC Min Erase Count
0xA7	TLC Average Erase Count
0xA8	Max Erase Count in spec
0xA9	Remain Life Percentage
0xB1	Wear Leveling Count
0xB5	Program Fail Count
0xB6	Erase Fail Count
0xBB	Uncorrectable Error Count
0xC0	Power off Retract Count
0xC2	Temperature
0xC4	Reallocation Event Count
0xC7	UDMA CRC Error
0xE8	Available Reserved Space
0xF1	Write Sector Count
0xF2	Read Sector Count
0xF5	Flash Write count



## 5.0 Pin assignment and descriptions

### 5.1 SATA Interface

#### ■ SATA Interface



**Figure 5-1 SATA Interface**

Pin	Type	Description
1	CONFIG_3	Ground
2	3.3 V	Supply pin, 3.3 V
3	GND	Ground
4	3.3 V	Supply pin, 3.3 V
5	No connect	No connect
6	No connect	No connect
7	No connect	No connect
8	No connect	No connect
9	No connect	No connect
10	DAS/DSS	Device Activity Signal / Disable Staggered Spin-up
11	No connect	No connect
12	(removed for key)	Mechanical notch B
13	(removed for key)	Mechanical notch B
14	(removed for key)	Mechanical notch B
15	(removed for key)	Mechanical notch B

16	(removed for key)	Mechanical notch B
17	(removed for key)	Mechanical notch B
18	(removed for key)	Mechanical notch B
19	(removed for key)	Mechanical notch B
20	No connect	No connect
21	CONFIG_0	Ground
22	No connect	No connect
23	No connect	No connect
24	No connect	No connect
25	No connect	No connect
26	No connect	No connect
27	GND	Ground
28	No connect	No connect
29	No connect	No connect
30	No connect	No connect
31	No connect	No connect
32	No connect	No connect
33	GND	Ground
34	No connect	No connect
35	No connect	No connect
36	No connect	No connect
37	No connect	No connect
38	DEVSLP	Device Sleep, Input. If driven high the host is informing the SSD to enter a low power state.
39	GND	Ground
40	No connect	No connect
41	SATA-B+	Host receiver differential signal pair.
42	No connect	No connect
43	SATA-B-	Host receiver differential signal pair.
44	No connect	No connect
45	GND	Ground

46	No connect	No connect
47	SATA-A-	Host transmitter differential pair.
48	No connect	No connect
49	SATA-A+	Host transmitter differential pair.
50	No connect	No connect
51	GND	Ground
52	No connect	No connect
53	No connect	No connect
54	No connect	No connect
55	No connect	No connect
56	No connect	No connect
57	GND	Ground
58	No connect	No connect
59	(removed for key)	Mechanical notch M
60	(removed for key)	Mechanical notch M
61	(removed for key)	Mechanical notch M
62	(removed for key)	Mechanical notch M
63	(removed for key)	Mechanical notch M
64	(removed for key)	Mechanical notch M
65	(removed for key)	Mechanical notch M
66	(removed for key)	Mechanical notch M
67	No connect	No connect
68	No connect	No connect
69	CONFIG_1	Ground
70	3.3 V	Supply pin, 3.3 V
71	GND	Ground
72	3.3 V	Supply pin, 3.3 V
73	GND	Ground
74	3.3 V	Supply pin, 3.3 V
75	CONFIG_2	Ground

**[Table 5-2] SATA Pin Assignment**

## 6.0 Product Line up

**Table 6-1 Product Line up**

Part Number	Capacity	Type	Remark
IM2S3334-064GD	64GB	M.2 2242 SATA	0°C ~ 70°C
IM2S3334-128GD	128GB	M.2 2242 SATA	0°C ~ 70°C
IM2S3334-256GD	256GB	M.2 2242 SATA	0°C ~ 70°C
IM2S3334-512GD	512GB	M.2 2242 SATA	0°C ~ 70°C
IM2S3334-064GP	64GB	M.2 2242 SATA	-40°C ~ 85°C
IM2S3334-128GP	128GB	M.2 2242 SATA	-40°C ~ 85°C
IM2S3334-256GP	256GB	M.2 2242 SATA	-40°C ~ 85°C
IM2S3334-512GP	512GB	M.2 2242 SATA	-40°C ~ 85°C

## 7.0 Package Specifications

