

M.2 2280 SATA SSD



Product Name: IM2S3338

Capacity: 64GB、128GB、256GB、512GB、1TB

Revision History

Revision	Date	Description	Editor
0	May.7. 2019	Initial release	Terry Chu
1	Oct. 18. 2019	Change to IA format	Steven Wang
2	Apr. 24. 2020	Add DWPD	Austin Lee

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Key Features

- **Capacity:**
 - 64GB, 128GB, 256GB, 512GB, 1TB
- **NAND Flash:** 3D TLC
- **Form Factor:** M.2 2280
- **Compatibility:**
 - Serial ATA 6Gb/s interface
 - Complies with ATA-8 Standard
 - Complies ATA Revision 3.1
 - S.M.A.R.T. features supported
 - NCQ Command set supported
 - Support DEVSLP
 - TCG OPAL 2.0
- **Performance:**
 - Sequential Read:
Up to 560MB/s
 - Sequential Write:
Up to 520MB/s
 - Random 4K Read:
Up to 85K
 - Random 4K Write:
Up to 74K
- **Power Consumption (Max.):**
 - Slumber: 0.05W
 - Active: 0.55W
 - Device sleep : 4mW
 - SR/SW : 1.9w/2.2w
 - RR/RW: 2.3w/1.8w
- **Temperature:**
 - Operation: 0°C - 70°C (Normal)
 - Operation: -40°C - 85°C(Wide)
 - Non-operation: -55°C - 95°C
- **Humidity:**
 - 0°C to 55°C / 5% - 95% RH,
non-condensing
- **Shock:**
 - 1500G/0.5ms
- **Vibration:**
 - 20G Peak, 80~2000Hz
- **Reliability:**
 - MTBF: 2,000,000 hours
 - DWPD : 1.16

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 ADATA M.2 2280 SSD IM2S3338 offers capacities up to 1TB using Synchronous 3D TLC NAND type flash memories.

2.0 Mechanical Specification

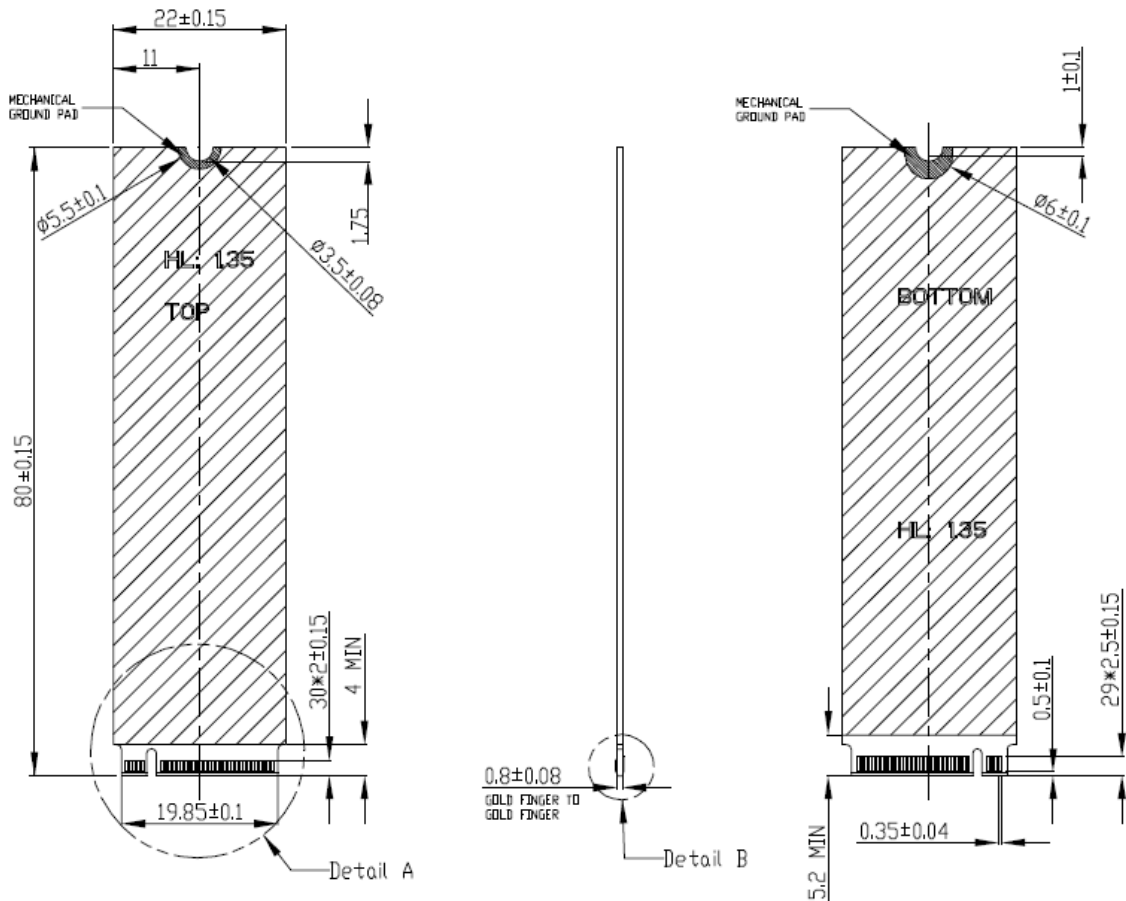
All product specifications not covered in this document (electrical performance, appearance, etc.) are in accordance with ADATA's defined norms and standards.

2.1 Physical dimensions and Weight

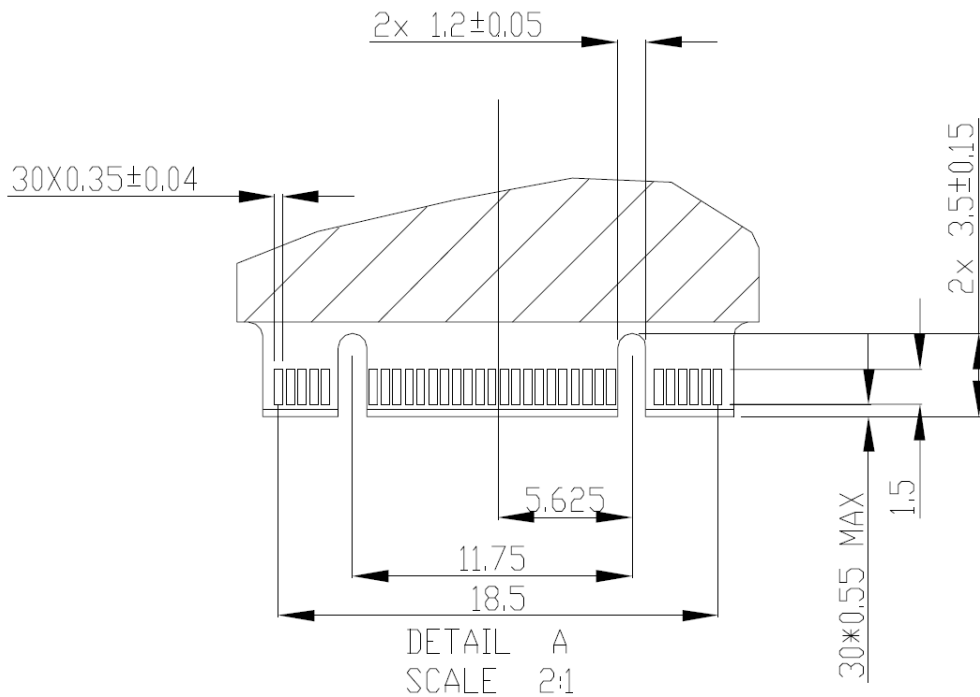
Table 2-1 Dimensions and Weight

Model	Length(mm)	Width(mm)	Height(mm)	Weight(gram)
64GB	80.00±0.15	22.00±0.15	Max 3.6	5.6±0.2
128GB	80.00±0.15	22.00±0.15	Max 3.6	5.6±0.2
256GB	80.00±0.15	22.00±0.15	Max 3.6	5.6±0.2
512GB	80.00±0.15	22.00±0.15	Max 3.6	6.1±0.2
1TB	80.00±0.15	22.00±0.15	Max 3.6	6.5±0.2

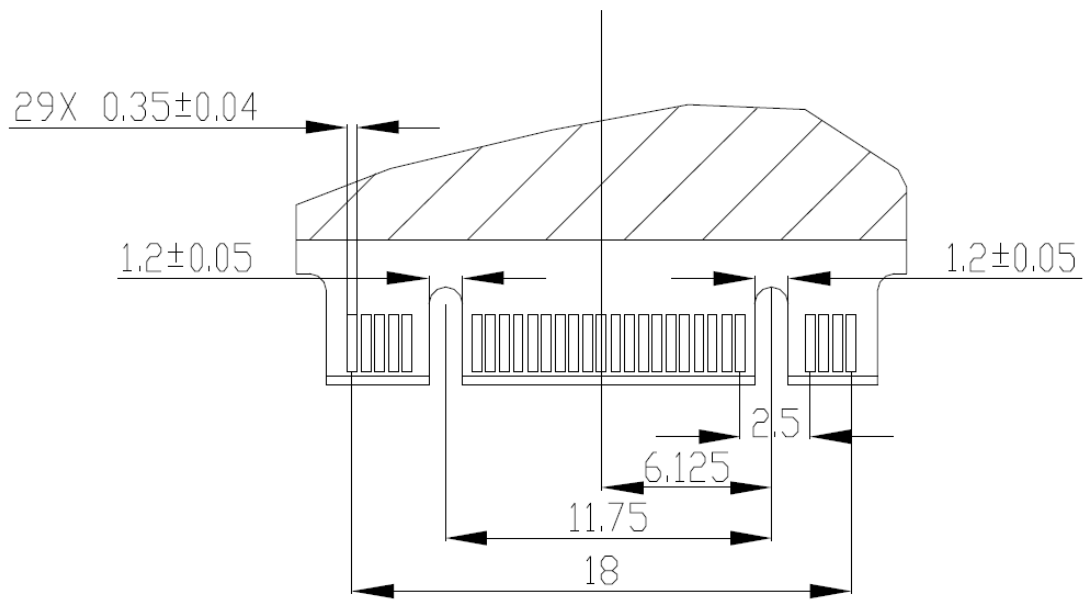
2.2 Product Dimensions



Product Dimensions of M.2



TOP



DETAIL B
 SCALE 2:1

Bottom

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

Model	IM2S3338				
Unformatted Capacity	64GB	128GB	256GB	512GB	1TB
Total User Addressable Sectors (LBA Mode)	125,045,424	250,069,680	500,118,192	1,000,215,216	2,000,409,264

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)

	64GB	128GB	256GB	512GB	1TB	Unit
Sequential Read	400	560	560	560	560	MB/s
Sequential Write	65	350	500	520	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)

	64GB	128GB	256GB	512GB	1TB	Unit
Sequential Q32 Read	400	560	560	560	560	MB/s
Sequential Q32 Write	65	350	500	520	520	MB/s

-Seq. Read & Write speed test by Crystal Disk Mark 3.0.1

3.3.3 IOPS Performance

Table 3-4 Read/Write & IOPS Performance

	64GB	128GB	256GB	512GB	1TB	Unit
4K Random Read	29K	51K	80K	85K	85K	IOPS
4K Random Write	16K	33K	64K	74K	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)

	64GB	128GB	256GB	512GB	1TB	Unit
Sequential Read	360	520	520	520	520	MB/s
Sequential Write	60	220	300	350	350	MB/s
4K-64 Thrd Read	90	180	300	300	385	MB/s
4K-64 Thrd Write	60	100	280	300	300	MB/s

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

3.4 Electrical

3.4.1 Operating Voltage

Table 3-7 Operating Voltage

Operating Voltage	
Input Power	DC 3.3V ± 5%
Maximum Ripple	100mV p-p or less

3.4.2 Power Consumption (Typical)

Table 3-8 Power Consumption (Typical)

	64GB	128GB	256GB	512GB	1TB	Unit
Slumber	0.05	0.05	0.05	0.05	0.05	W
Active	0.5	0.5	0.5	0.5	0.55	W
Sequential Read	1.7	1.7	1.7	1.7	1.9	W
Sequential Write	2.1	2.1	2.1	2.2	2.2	W
Random Read	1.6	1.6	2.0	2.1	2.3	W
Random Write	1.7	1.7	1.8	1.8	1.8	W
Devslp	3	3	3	3	4	mW

3.5 Environmental Conditions

Table 3-9 Temperature, Humidity, Shock, Vibration

Feature	Operating (Normal)	Operating (Wide)	Non-Operating
Temperature	0°C to 70°C	-40°C to 85°C	-55°C to 95°C
Humidity	5%~95%	5%~95%	5%~95%

Vibration	20G Peak, 80~2000Hz
Shock	1500G, duration 0.5ms, Half Sine Wave

3.6 Reliability

Table 3-10 Reliability Specification

Parameter	Value
Mean Time Between Failures (MTBF) 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 JESD219 client workload.

Table 3-11 Tera Byte Written

TLC	64GB	128GB	256GB	512GB	1TB	Unit
TBW	80	160	320	640	1280	TB

4.0 Supported Command Sets

4.1 Identify Controller

ADATA IM2S3338 responds to IDENTIFY Controller command with a pre-defined string of information on features, hardware and firmware revision information, and functionality support indicators.

Word	F / V	Default Value	Description
0	F	0040h	General configuration
1	X	XXXXh	Default number of cylinders
2	V	XXXXh	Specific configuration
3	X	00XXh	Obsolete
4	X	0000h	Retired
5	X	0204h	Retired
6	F	XXXXh	Obsolete
7 - 8	V	XXXXh	Reserved for assignment by the CompactFlash Association
9	X	0000h	Retired
10 - 19	F	XXXXh	Serial number in ASCII (Right justified)
20 - 21	X	0002h	Retired
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	8002h	READ/WRITE MULTIPLE support
48	F	4000h	Reserved
49	F	0F00h	Capabilities
50	F	4000h	Capabilities
51 - 52	F	0200h	Obsolete
53	F	0007h	Field validity
54	X	XXXXh	Current Cylinders
55	X	XXXXh	Current Heads
56	X	XXXXh	Current SectorPerTrack
57 - 58	X	XXXXh	Current capacity in sectors (LBAs)
59	F	9101h	Multiple sector setting Multiple Sector Setting is Valid Current Sector Number of Multiple R/W:0x01
60 - 61	F	XXXXh	Total number of user addressable sectors
62	X	0000h	Obsolete
63	F	0XXXh	Multiword DMA transfer Support MDMA Mode 0 Support MDMA Mode 1 Support MDMA Mode 2

64	F	0003h	PIO transfer modes supported Support PIO Mode 3 Support PIO Mode 4
65	F	0078h	Minimum Multiword DMA transfer cycle time per word
66	F	0078h	Device recommended Multiword DMA cycle time
67	F	0078h	Minimum PIO transfer cycle time without IORDY flow control
68	F	0078h	Minimum PIO transfer cycle time with IORDY flow control
69	F	4D20h	Additional Supported Trimmed LBA range(s) returning zeroed data is supported Optional ATA device 28-bit commands supported Download Microcode DMA is supported Write Buffer DMA is supported Read Buffer DMA is supported Deterministic read after TRIM is supported
75	F	001Fh	Queue depth Maximum Queue Depth - 1 : 31
76	F	870Eh	Serial ATA capabilities Support Serial ATA Gen1 signaling speed (1.5 Gbps) Support Serial ATA Gen2 signaling speed (3.0 Gbps) Support Serial ATA Gen3 signaling speed (6.0 Gbps) Support NCQ(Native Command Queuing) Support receipt of host-initiated interface power management requests Support Phy event counters Support READ LOG DMA EXT as equivalent to READ LOG EXT
77	F	0002h	Serial ATA Additional capabilities Current negotiated Serial ATA signal speed : Gen1
78	F	014Ch	Serial ATA features supported Support DMA Setup Auto-Activate optimization Device supports initiating interface power management Support software settings preservation Device Sleep supported
79	V	0040h	Serial ATA features enabled Software settings preservation enabled
80	F	07F0h	Major revision number supports ATA/ATAPI-4 supports ATA/ATAPI-5 supports ATA/ATAPI-6 supports ATA/ATAPI-7 supports ATA/ATAPI-8 supports ACS2 supports ACS3

81	F	0000h	Minor version number Reserved
82	F	746Bh	Features/command sets supported 0 Command and Feature Set Support Support SMART Feature Set Support Security Mode Feature Set Support Power management Feature set Support Write Cache Support Look-Ahead Support Host Protected Area Feature Set Support WRITE BUFFER command Support READ BUFFER command Support NOP command
83	F	7501h	Features/command sets supported 1 Support DOWNLOAD MICROCODE Command SET MAX security extension supported 48-bit Address feature set supported Support FLUSH CACHE command Support FLUSH CACHE EXT command
84	F	4063h	Command Sets Support 2 Support SMART error logging Support SMART self-test The GPL feature set is supported WRITE DMA FUA EXT and WRITE MULTIPLE FUA EXT commands are supported
85	V	XXXXh	Features/command sets enabled 0 Enable SMART Feature Set Removable Media feature set is not supported Enable SMART Feature Set Packet Command feature set is not enabled Enable Write Cache Enable Look-Ahead Release Interrupt is not enabled Service interrupt is not enabled Device Reset command is not supported Enable Host Protected Area Feature Set Enable WRITE BUFFER command Enable READ BUFFER command Enable NOP command
86	V	XXXXh	Features/command sets enabled 1 Supported DOWNLOAD MICROCODE Command Read DMA Queue and Write DMA Queue are not supported

			Don't support Removable Media Status feature set 48-bit Address feature set Supported Support FLUSH CACHE command Support FLUSH CACHE EXT command
87	V	XXXXh	Features/command sets enabled 2 Support SMART error logging Support SMART self-test
88	V	407Fh	Ultra DMA modes True IDE UDMA mode 0 is supported True IDE UDMA mode 1 and below are supported True IDE UDMA mode 2 and below are supported True IDE UDMA mode 3 and below are supported True IDE UDMA mode 4 and below are supported True IDE UDMA mode 5 and below are supported True IDE UDMA mode 6 and below are supported True IDE UDMA mode 6 is selected
89	F	0001h	Time required for Security erase unit completion
90	F	0001h	Time required for Enhanced security erase unit completion
91	V	0000h	Advanced power management level value
92	V	FFFEh	Master Password Revision Code
93	V	0000h	Hardware configuration test results
94	V	0000h	Current automatic acoustic management value
95	V	0000h	Stream Minimum Request Size
96	V	0000h	Streaming Transfer Time -- DMA
97	V	0000h	Streaming Access Latency - DMA and PIO
98 - 99	V	0000h	Streaming Performance Granularity
100 - 103	V	XXXXh	Maximum user LBA for 48-bit Address feature set
104	V	0000h	Streaming Transfer Time - PIO
105	F	0008h	Reserved Maximum number of 512-byte blocks per Data Set Management command
106	V	0000h	Physical sector size / Logical Sector Size
107	V	0000h	Inter-seek delay for ISO 7779 standard acoustic testing
108 - 111	V	XXXXh	World Wide Name
112 - 115	V	XXXXh	Reserved for a 128-bit World Wide Name
116	V	XXXXh	Reserved for technical report
117 - 118	V	XXXXh	Logical Sector Size
119 - 126	V	XXXXh	Reserved
127	V	XXXXh	Removable Media Status Notification feature set support
128	X	XXXXh	Security Status Security Supported Security is disabled

			Enhanced security erase supported
129 - 159	X	XXXXh	Vendor specific
160	F	0000h	CFA Power mode
161	X	0000h	CFast Specific Support The device may support PHYSLP mode
162	X	0000h	Key Management Schemes Supported Support CPRM Scheme
163	F	0000h	CF Advanced True IDE Timing Mode Capabilities and Settings
169	F	0001h	Data Set Management is Supported Trim is supported
176 - 205	V	XXXXh	Current media serial number
206	V	XXXXh	SCT Command Transport The SCT Command Transport is supported The SCT Write Same Command is supported The SCT Feature Control Command is supported The SCT Data Tables Command is supported
222	F	107Fh	Transport Major Version Number Transport Type: Serial ATA8-AST SATA 1.0a SATA II: Extensions SATA Rev 2.5 SATA Rev 2.6 SATA Rev 3.0 SATA Rev 3.1
255	X	XXXXh	Integrity word EX: Checksum: 0x81 Signature: A5

Notes:

F = content (byte) is fixed and does not change.

V = content (byte) is variable and may change depending on the state of the device or the commands executed by the device.

X = content (byte) is vendor specific and may be fixed or variable.

R = content (byte) is reserved and shall be zero.

4.2 S.M.A.R.T. Attribute

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

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

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

6.0 Product Line up

Table 6-1 Product Line up

Part Number	Capacity	Type	Remark
IM2S3338-064GD	64GB	M.2 2280 SATA	
IM2S3338-128GD	128GB	M.2 2280 SATA	
IM2S3338-256GD	256GB	M.2 2280 SATA	
IM2S3338-512GD	512GB	M.2 2280 SATA	
IM2S3338-001TD	1TB	M.2 2280 SATA	
IM2S3338-064GP	64GB	M.2 2280 SATA	
IM2S3338-128GP	128GB	M.2 2280 SATA	
IM2S3338-256GP	256GB	M.2 2280 SATA	
IM2S3338-512GP	512GB	M.2 2280 SATA	
IM2S3338-001TP	1TB	M.2 2280 SATA	

7.0 Package Specifications

