

2.5" SATA SSD



Product Name: ISSS332

Capacity: 8GB、16GB、32GB、64GB、128GB、256GB、512GB、1TB

Revision History

Revision	Date	Description	Editor
0	Feb.2016	Initial release	Sway Lin
1	Apr.2016	Modify SLC data & Product Dimensions Update	Sway Lin
2	Apr.2016	Add A+SLC	Sway Lin
3	May.2017	Modify performance Datasheet format	Sway Lin
4	May.2017	Add Special Feature Specification	Sway Lin
5	Aug.2017	Add TBW	Sway Lin
6	Nov.2017	Modify page 14	Sway Lin
7	Aug.2018	Change Product Pictures & Modify Key Features	Sway Lin
8	Nov. 2019	Update IA format	Steven Wang

Table of Contents

1.0 General Description	1
2.0 Mechanical Specification	2
2.1 Physical dimensions and Weight	2
2.2 Product Dimensions	2
3.0 Product Specification	3
3.1 Interface and configuration.....	3
3.2 Capacity.....	3
3.3 Performance.....	3
3.4 Electrical.....	6
3.5 Environmental Conditions	7
3.6 Reliability.....	7
3.7 Endurance	7
4.0 Supported Command Sets	8
4.1 Identify Device	8
4.2 SMART Attribute	11
5.0 Pin assignment and descriptions	12
6.0 Product Line up.....	13
7.0 Package Specifications	13

Key Features

- **Capacity:**
 - 8GB, 16GB, 32GB, 64GB, 128GB, 256GB, 512GB, 1TB
- **NAND Flash:** MLC
- **Form Factor:** 2.5 inch SATA
- **Compatibility:**
 - Serial ATA 6Gb/s interface
 - Complies with ATA-8 Standard
 - Complies SATA Revision 3.1
 - S.M.A.R.T. features supported
 - NCQ Command set supported
- **Performance:**
 - Sequential Read:
Up to 560MB/s
 - Sequential Write:
Up to 440MB/s
 - Max Random 4K Read:
Up to 70,000
 - Max Random 4K Write:
Up to 70,000
- **Power Consumption:**
 - Slumber: 0.06W
 - Active: 0.5W
 - SR/SW: 1.8W / 3.5W
 - RR/RW: 1.5W / 2.3W
 - Device Sleep: 5mW
- **Temperature:**
 - Operation: 0°C - 70°C (Normal)
 - Operation: -40°C - 85°C(Wide)
- **Reliability:**
 - Shock: 1500G/0.5ms
 - Vibration 20G Peak, 10~2000Hz
 - MTBF: 2,000,000 hours
 - TBW : 2000TB

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 SSD lifetime, the SSD solutions are your best choice on wide-ranged mobile computing devices and industrial electronic products. With standard SATA form factor or customized module form factor. The 2.5" ADATA SSD ISSS332 offers capacities up to 1TB using Synchronous MLC 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.

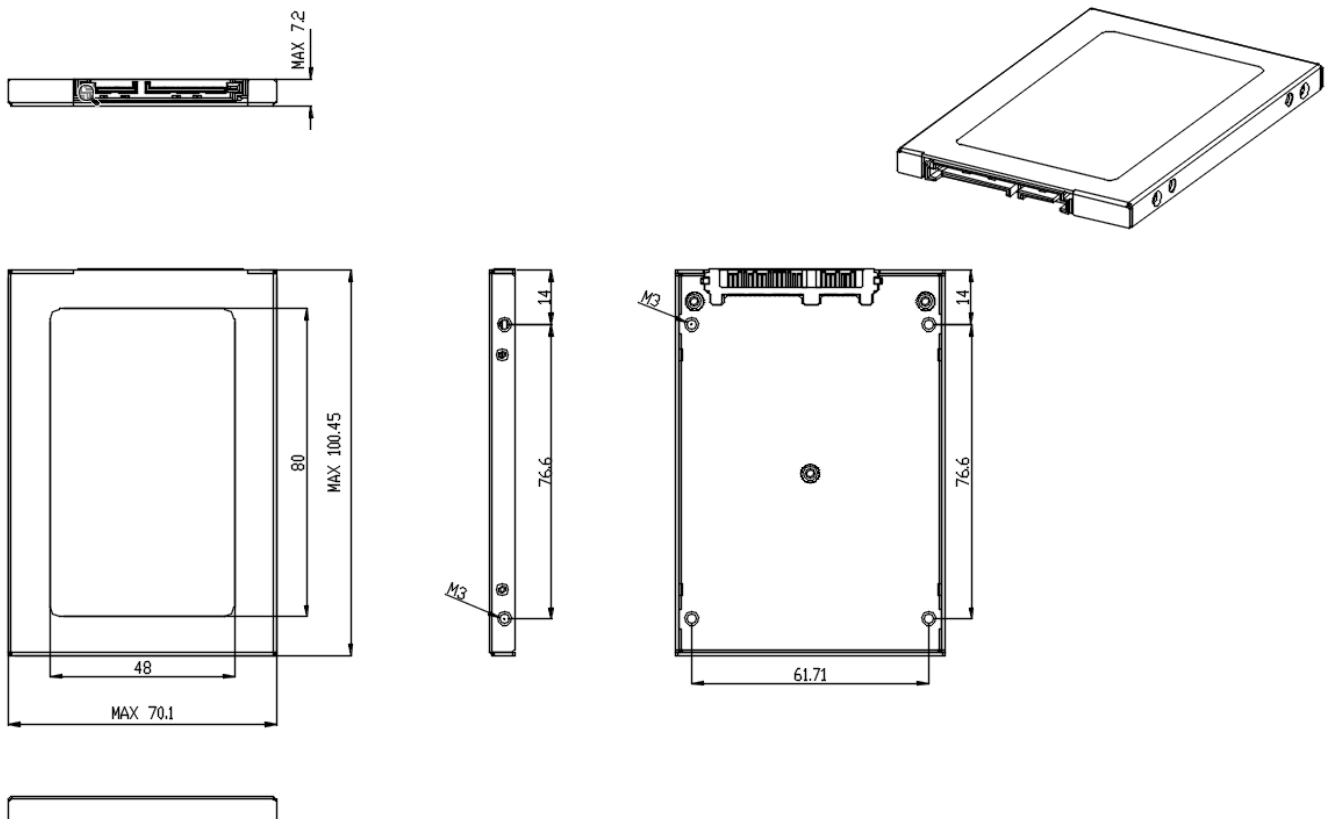
2.1 Physical dimensions and Weight

Table 2-1 Dimensions and Weight

Model	Length(mm)	Width(mm)	Height(mm)	Weight(gram)
8GB	100 +/- 0.45	70 +/- 0.1	7.0 +/- 0.2	50 +/- 5
16GB	100 +/- 0.45	70 +/- 0.1	7.0 +/- 0.2	50 +/- 5
32GB	100 +/- 0.45	70 +/- 0.1	7.0 +/- 0.2	50 +/- 5
64GB	100 +/- 0.45	70 +/- 0.1	7.0 +/- 0.2	50 +/- 5
128GB	100 +/- 0.45	70 +/- 0.1	7.0 +/- 0.2	50 +/- 5
256GB	100 +/- 0.45	70 +/- 0.1	7.0 +/- 0.2	50 +/- 5
512GB	100 +/- 0.45	70 +/- 0.1	7.0 +/- 0.2	50 +/- 5
1TB	100 +/- 0.45	70 +/- 0.1	7.0 +/- 0.2	50 +/- 5

2.2 Product Dimensions

Figure 2-1 Product Dimensions



3.0 Product Specification

3.1 Interface and configuration

- Compliant with Serial ATA International Organization: Serial ATA Revision 3.1
- Compliant SSD Alliance compliance program.
- Support ATA-8 Command Set
- Support 1-port 1.5/3.0/6.0Gbps SATA I/II/III interface.

3.2 Capacity

Table 3-1 User Addressable Sectors

Model	ISSS332			
Unformatted Capacity	8GB	16GB	32GB	64GB
Total User Addressable Sectors (LBA Mode)	15,649,200	31,277,232	62,521,344	125,045,424

Model	ISSS332			
Unformatted Capacity	128GB	256GB	512GB	1TB
Total User Addressable Sectors (LBA Mode)	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)

MLC	16GB	32GB	64GB	128GB	256GB	512GB	1TB	Unit
Sequential Read	110	250	550	550	560	560	560	MB/s
Sequential Write	20	40	80	180	360	440	440	MB/s

SLC	4GB	8GB	16GB	Unit
Sequential Read	40	240	480	MB/s
Sequential Write	20	60	120	MB/s

A+ SLC	128GB	256GB	Unit
Sequential Read	560	560	MB/s
Sequential Write	450	450	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)

MLC	16GB	32GB	64GB	128GB	256GB	512GB	1TB	Unit
Sequential Q32 Read	110	250	500	520	520	520	520	MB/s
Sequential Q32 Write	20	40	90	180	360	440	440	MB/s

SLC	4GB	8GB	16GB	Unit
Sequential Q32 Read	40	220	440	MB/s
Sequential Q32 Write	20	60	120	MB/s
4K-QD32 Read	30	120	240	MB/s
4K-QD32 Write	20	60	120	MB/s

A+ SLC	128GB	256GB	Unit
Sequential Q32 Read	500	500	MB/s
Sequential Q32 Write	450	450	MB/s
4K-QD32 Read	250	250	MB/s
4K-QD32 Write	300	300	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

MLC	16GB	32GB	64GB	128GB	256GB	512GB	1TB	Unit
4K Random Read	10K	25K	50K	60K	60K	60K	60K	IOPS
4K Random Write	4.5K	10K	20K	45K	50K	50K	50K	IOPS

SLC	4GB	8GB	16GB	Unit
4K Random Read	5K	15K	60K	IOPS
4K Random Write	0.5K	2K	30K	IOPS

A+ SLC	128GB	256GB	Unit
4K Random Read	60K	70K	IOPS
4K Random Write	60K	70K	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)

	16GB	32GB	64GB	128GB	256GB	512GB	1TB	Unit
Sequential Read	105	250	450	480	480	480	480	MB/s
Sequential Write	15	45	90	180	360	400	400	MB/s
4K-64 Thrd Read	35	80	180	250	275	275	275	MB/s
4K-64 Thrd Write	15	40	70	150	250	250	250	MB/s

	4GB	8GB	16GB	Unit
Sequential Read	30	230	420	MB/s
Sequential Write	15	50	100	MB/s
4K-64 Thrd Read	25	120	200	MB/s
4K-64 Thrd Write	10	60	120	MB/s

	128GB	256GB	Unit
Sequential Read	480	480	MB/s
Sequential Write	400	400	MB/s
4K-64 Thrd Read	240	260	MB/s
4K-64 Thrd Write	240	260	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 5.0V ± 10%
Maximum Ripple	100mV p-p or less

3.4.2 Power Consumption (Typical)

Table 3-7 Power Consumption (Typical)

	16GB	32GB	64GB	128GB	256GB	512GB	1TB	Unit
Slumber	0.05	0.05	0.05	0.05	0.05	0.05	0.06	W
Active	0.4	0.4	0.4	0.4	0.4	0.4	0.4	W
Sequential Read	0.8	1.0	1.1	1.2	1.3	1.5	1.8	W
Sequential Write	1	1.5	2	2.6	3.0	3.2	3.5	W
Random Read	1	1.1	1.2	1.3	1.3	1.5	1.5	W
Random Write	1	1.2	1.6	1.8	2.0	2.0	2.3	W
Device Sleep	5	14	14	14	15	15	16	mW

	4GB	8GB	16GB	Unit
Slumber	0.03	0.03	0.03	W
Active	0.4	0.4	0.4	W
Sequential Read	0.8	1	1.5	W
Sequential Write	0.8	1	1.5	W
Random Read	0.8	1	1.5	W
Random Write	0.8	0.9	1.4	W
Device Sleep	5	14	15	mW

	128GB	256GB	Unit
Slumber	0.04	0.04	W
Active	0.5	0.5	W
Sequential Read	1.0	1.2	W
Sequential Write	1	1.2	W
Random Read	1.2	1.5	W
Random Write	0.7	1	W

Device Sleep	5	5	mW
---------------------	---	---	----

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, and 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% RH, non-condensing	
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	Simulate 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 3-10] Tera Byte Written

MLC

Total Byte Written (TBW)	16GB	32GB	64GB	128GB	256GB	512GB	1TB	Unit
	15	30	60	120	250	500	1000	TB

SLC

Total Byte Written (TBW)	4GB	8GB	16GB	Unit
	80	170	350	TB

A+ SLC

Total Byte Written (TBW)	128GB	256GB	Unit
	1000	2000	TB

4.0 Supported Command Sets

4.1 Identify Device

IDENTIFY DEVICE (ECh). This commands read out 512Bytes of drive parameter information. Parameter Information consists of the arrangement and value as shown in the following table. This command enables the host to receive the Identify Drive Information from the device.

[Table 4-1] 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"> • Supports Serial ATA Gen3 • Supports Serial ATA Gen2 • Supports Serial ATA Gen1 • Supports Phy event counters log • Supports receipt of host initiated power management requests • Supports Native Command Queuing
77	F	0080h	Serial ATA additional capability <ul style="list-style-type: none"> • DevSleep_to_ReducedPwerState
78	F	0148h	Serial ATA features supported <ul style="list-style-type: none"> • Supports Device Sleep • Supports software settings preservation • Device supports initiating power management
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:

F/V = Fixed/variable content.

F = the content of the word is fixed and does not change. For removable media devices, these values may change when media is removed or changed.

V = the contents of the word is variable and may change depending on the state of the device or the commands executed by the device.

X = the content of the word may be fixed or variable.

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.

[Table 4-2] S.M.A.R.T. Attribute

Attribute ID (hex)	Raw Attribute Value							Attribute Name
01	MSB	00	00	00	00	00	00	Read error rate
05	LSB	MSB	00	00	00	00	00	Reallocated sectors count
09	LSB	-	-	MSB	00	00	00	Power-on hours
0C	LSB	-	-	MSB	00	00	00	Power cycle count
A0	LSB	-	-	MSB	00	00	00	Uncorrectable sector count when read/write
A1	LSB	MSB	00	00	00	00	00	Number of valid spare block
A3	LSB	MSB	00	00	00	00	00	Number of initial invalid block
A4	LSB	-	-	MSB	00	00	00	Total erase count
A5	LSB	-	-	MSB	00	00	00	Maximum erase count
A6	LSB	-	-	MSB	00	00	00	Minimum erase count
A7	LSB	-	-	MSB	00	00	00	Average erase count
A8	LSB	-	-	MSB	00	00	00	Max. erase count of Spec.
A9	LSB	-	-	MSB	00	00	00	Remain Life(percentage)
AF	LSB	-	-	MSB	00	00	00	Program fail count in worst die
B0	LSB	MSB	00	00	00	00	00	Erase fail count in worst die
B1	LSB	-	-	MSB	00	00	00	Total wear level count
B2	LSB	MSB	00	00	00	00	00	Runtime invalid block count
B5	LSB	-	-	MSB	00	00	00	Total program fail count
B6	LSB	MSB	00	00	00	00	00	Total erase fail count
C0	LSB	MSB	00	00	00	00	00	Power-off retract count
C2	MSB	00	00	00	00	00	00	Controlled temperature
C3	LSB	-	-	MSB	00	00	00	Hardware ECC recovered
C4	LSB	-	-	MSB	00	00	00	Reallocation event count
C5	LSB			MSB	00	00	00	Current pending sector count
C6	LSB	-	-	MSB	00	00	00	Uncorrectable error count off-line
C7	LSB	MSB	00	00	00	00	00	Ultra DMA CRC error count
E8	LSB	MSB	00	00	00	00	00	Available reserved space
F1	LSB	-	-	-		-	MSB	Host written LBAs (each write unit = 32MB)
F2	LSB	-	-	-		-	MSB	Host read LBAs (each read unit = 32MB)
F5	LSB	-	-	-		-	MSB	Total data written to flash (each write unit = 32MB)

5.0 Pin assignment and descriptions

Signals	S1	GND	System Ground
	S2	Rx+	Differential signals pair receive
	S3	Rx-	
	S4	GND	System Ground
	S5	Tx-	Differential signals pair transmit
	S6	Tx+	
	S7	GND	System Ground
Power	P1	V33	NC
	P2	V33	NC
	P3	DEVSLP	Device Sleep Signal Pin
	P4	GND	System Ground
	P5	GND	System Ground
	P6	GND	System Ground
	P7	V5/PC	+5V Power supply, 2 nd Pre-charge
	P8	V5	+5V Power supply
	P9	V5	+5V Power supply
	P10	GND	System Ground
	P11	DAS	Reserved
	P12	GND	System Ground
	P13	V12/PC	NC
	P14	V12	NC
	P15	V12	NC

6.0 Product Line up

Table 6-1 Product Line up

Part Number	Capacity	Type	Remark
ISSS332-032GMP	32GB	2.5 Inch SATA	0°C-70°C, PLP
ISSS332-064GMP	64GB	2.5 Inch SATA	
ISSS332-128GMP	128GB	2.5 Inch SATA	
ISSS332-256GMP	256GB	2.5 Inch SATA	
ISSS332-512GMP	512GB	2.5 Inch SATA	
ISSS332-001TMP	1TB	2.5 Inch SATA	
ISSS332-016GF	16GB	2.5 Inch SATA	0°C-70°C, SLC
ISSS332-008GFP	8GB	2.5 Inch SATA	0°C-70°C, SLC,PLP
ISSS332-016GFP	16GB	2.5 Inch SATA	
ISSS332-064GFP	64GB	2.5 Inch SATA	
ISSS332-128GMA	128GB	2.5 Inch SATA	0°C-70°C,AES
ISSS332-016GM	16GB	2.5 Inch SATA	0°C-70°C,MLC
ISSS332-032GM	32GB	2.5 Inch SATA	
ISSS332-064GM	64GB	2.5 Inch SATA	
ISSS332-120GM	120GB	2.5 Inch SATA	
ISSS332-128GM	128GB	2.5 Inch SATA	
ISSS332-256GM	256GB	2.5 Inch SATA	
ISSS332-512GM	512GB	2.5 Inch SATA	
ISSS332-001TM	1TB	2.5 Inch SATA	
ISSS332-032GTP	32GB	2.5 Inch SATA	-40°C-85°C, PLP
ISSS332-064GTP	64GB	2.5 Inch SATA	
ISSS332-128GTP	128GB	2.5 Inch SATA	
ISSS332-256GTP	256GB	2.5 Inch SATA	
ISSS332-512GTP	512GB	2.5 Inch SATA	
ISSS332-001TTP	1TB	2.5 Inch SATA	
ISSS332-016GW	16GB	2.5 Inch SATA	-40°C-85°C, SLC
ISSS332-016GWP	16GB	2.5 Inch SATA	-40°C-85°C, SLC, PLP
ISSS332-016GT	16GB	2.5 Inch SATA	-40°C-85°C,MLC
ISSS332-032GT	32GB	2.5 Inch SATA	
ISSS332-064GT	64GB	2.5 Inch SATA	
ISSS332-128GT	128GB	2.5 Inch SATA	
ISSS332-256GT	256GB	2.5 Inch SATA	
ISSS332-512GT	512GB	2.5 Inch SATA	
ISSS332-001TT	1TB	2.5 Inch SATA	

7.0 Package Specifications

