innodisk

Total Solution For
Industrial Flash Storage

InnoAGE

mSTA 3TI7

Customer: _____

Customer Part Number: _____

Innodisk Part Number: _____

Innodisk Model Name: _____

Date: _____

Innodisk Approver	Customer Approver

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Revision History

Revision	Description	Date
Rev 1.0	First Release	Aug., 2020
Rev 1.1	Add 32GB LBA Value Modify Part Number Rule	Nov., 2020
Rev 1.2	Add SMART Attribute Modify Part Number Rule	Jan., 2021

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1. Product Overview

1.1 Introduction of Innodisk InnoAGE mSATA 3TI7

The InnoAGE™ mSATA 3TI7 comes with a Microsoft Azure Sphere inside, and is further integrated with Innodisk's customized firmware, software, and hardware technology. This new solution enables multifunctional management: smart data analysis and updates, data security, and remote control through the cloud, while benefitting from the power of the Azure Sphere to guarantee secured communications between the SSD and the cloud.

The InnoAGE™ mSATA (S80) 3TI7 delivers an easy-to-use interface with its customized cloud management platform. In technical terms, the Innodisk-developed firmware receives commands from the Azure Sphere via a second connection to Azure. Therefore, it is able to execute SSD debugging messages as well as monitor read/write behavior patterns to increase the storage device's lifespan. Most importantly, system operators can quickly revert to the default settings from the cloud-based dashboard in the case of a device or system crash.

In other words, the InnoAGE™ mSATA 3TI7 is designed for both in-band and out-of-band network management, providing full recovery even when the operating system has crashed or is severely impaired to the extent that in-band management would be of little help.

CAUTION TRIM must be enabled.

TRIM enables SSD's controller to skip invalid data instead of moving. It can free up significant amount of resources, extends the lifespan of SSD by reducing erase, and write cycles on the SSD. Innodisk's handling of garbage collection along with TRIM command improves write performance on SSDs.

1.2 Product View and Models

Innodisk InnoAGE mSATA 3TI7 is available in follow capacities within 3D NAND flash ICs.

InnoAGE M.2 (S80) 3TI7 32GB-256GB

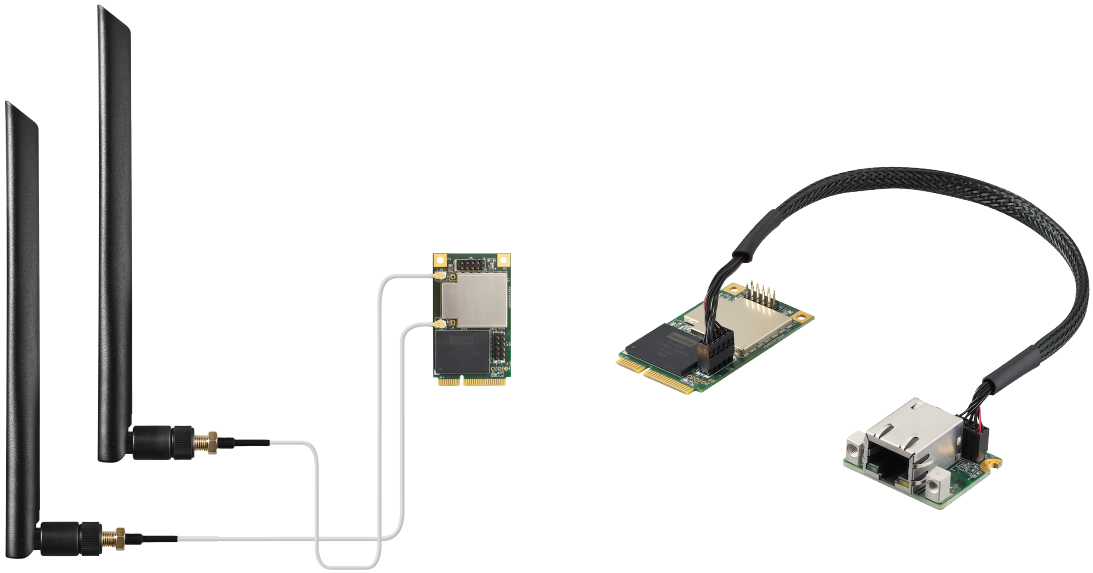


Figure 1: Innodisk InnoAGE mSATA 3TI7

1.3 SATA Interface

Innodisk InnoAGE mSATA 3TI7 supports SATA III(6.0Gb/s) interface, and compliant with SATA I (1.5Gb/s) and SATA II(3.0Gb/s).

2. Product Specifications

2.1 Capacity and Device Parameters

InnoAGE mSATA 3TI7 device parameters are shown in Table 1.

Table 1: Device parameters

Capacity	P/N	OS back-up capacity (GB)	LBA	User Capacity(GB)
32GB	DTMSR-32GDK1*1*2*3SL10G	10	32771008	15.6
64GB	DTMSR-64GDK1*1*2*3DL10G	10	96259888	45.9
	DTMSR-64GDK1*1*2*3DL20G	20	75288368	35.9
128GB	DTMSR-A28DK1*1*2*3QL10G	10	213470128	101.7
	DTMSR-A28DK1*1*2*3QL20G	20	19249860	91.7
	DTMSR-A28DK1*1*2*3QL30G	30	171527088	81.7
	DTMSR-A28DK1*1*2*3QL40G	40	150555568	71.7
	DTMSR-A28DK1*1*2*3QL50G	50	129584048	61.7
256GB	DTMSR-B56DK1*1*2*3QL10G	10	447890608	213.5
	DTMSR-B56DK1*1*2*3QL20G	20	426919088	203.5
	DTMSR-B56DK1*1*2*3QL30G	30	405947568	193.5
	DTMSR-B56DK1*1*2*3QL40G	40	384976048	183.5
	DTMSR-B56DK1*1*2*3QL50G	50	364004528	173.5
Note	*1 E: Azure Cloud; J: Private Cloud *2 C: standard temperature (0'C to 70'C); W: wide temperature (-40'C to 85'C) *3 A: with Wi-Fi antenna; B: with Ethernet daughter board			

2.2 Performance

Burst Transfer Rate: 6.0Gbps

Table2: Performance[1]

Capacity	32GB	64GB	128GB	256GB
Sequential[2] Read (Max)	185 MB/s	370 MB/s	535 MB/s	535 MB/s
Sequential[2] Write (Max)	30 MB/s	65 MB/s	130 MB/s	260 MB/s
4KB Random[2] Read (QD32)	11,500	22,500	44,500	79,000
4KB Random[2] Write (QD32)	9,000	18,000	36,000	64,500

Note: 1. Performance based on CrystalDiskMark 5.1.2 with file size 1000MB of Queue Depth 32

2. Performance may vary based on various firmware version or test platform

2.3 Electrical Specifications

2.3.1 Power Requirement

Table 3: Innodisk InnoAGE mSATA 3TI7 Power Requirement

Item	Symbol	Rating	Unit
Input voltage	V_{IN}	+3.3 DC +- 5%	V

2.3.2 Power Consumption

Table 4: Power Consumption

Mode	32GB (mA)	64GB (mA)	128GB (mA)	256GB (mA)
Read	270	320	399	365
Write	240	265	330	435
Idle	205	210	210	210
Boot up	285	330	410	450

Note: 1. The workload equates 128KB with Queue Depth 32 sequential read & write

2.4 Environmental Specifications

2.4.1 Temperature Ranges

Table 5: Temperature range for InnoAGE mSATA 3TI7

Temperature	Range
Operating	Standard Grade: 0°C to +70°C
Storage	-55°C to +95°C

2.4.2 Humidity

Relative Humidity: 10-95%, non-condensing

2.4.3 Shock and Vibration

Table 6: Shock/Vibration Testing for InnoAGE mSATA 3TI7

Reliability	Test Conditions	Reference Standards
Vibration	7 Hz to 2K Hz, 20G, 3 axes	IEC 68-2-6
Mechanical Shock	Duration: 0.5ms, 1500 G, 3 axes	IEC 68-2-27

2.4.4 Mean Time between Failures (MTBF)

Table 7 summarizes the MTBF prediction results for various InnoAGE mSATA 3TI7 configurations. The analysis was performed using a RAM Commander™ failure rate prediction.

- **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.

Table 7: InnoAGE mSATA 3TI7 MTBF

Product	Condition	MTBF (Hours)
Innodisk InnoAGE mSATA 3TI7	Telcordia SR-332 GB, 25°C	>3,000,000

2.5 CE and FCC Compatibility

InnoAGE mSATA 3TI7 conforms to CE and FCC requirements.

2.6 RoHS Compliance

InnoAGE mSATA 3TI7 is fully compliant with RoHS directive.

2.7 Reliability

Parameter	Value
Read Cycles	Unlimited Read Cycles
Flash endurance	3,000 P/E cycles
Wear-Leveling Algorithm	Support
Bad Blocks Management	Support
DIE RAID Recovery	Support
Error Correct Code	Support

TBW* (Total Bytes Written) Units: TB

Capacity	Sequential workload	Client workload
32GB	84.3	37.5
64GB	168.6	75
128GB	337.2	150
256GB	674.4	250

* Note:

1. Sequential: Mainly sequential write, tested by Vdbench.
2. Client: Follow JESD218 Test method and JESD219A Workload, tested by ULINK. (The capacity lower than 64GB client workload is not specified in JEDEC219A, the values are estimated.)
3. Based on out-of-box performance.

2.8 Transfer Mode

InnoAGE mSATA 3TI7 support following transfer mode:

Serial ATA III 6.0Gbps

Serial ATA II 3.0Gbps

Serial ATA I 1.5Gbps

2.9 Pin Assignment

2.9.1 mSATA pin assignment

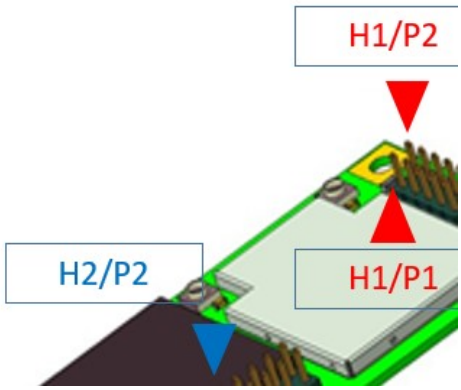
Innodisk InnoAGE mSATA 3TI7 uses a standard SATA pin-out. See Table 8 for InnoAGE mSATA 3TI7 pin assignment.

Table 8: Innodisk InnoAGE mSATA 3TI7 Pin Assignment

Signal Name	Pin #	Pin #	Signal Name
GND	51	52	+3.3V
DAS	49	50	GND
NC	47	48	NC
NC	45	46	NC
NC	43	44	DEVSLP
+3.3V	41	42	NC
+3.3V	39	40	GND
GND	37	38	NC
GND	35	36	NC
RX+	33	34	GND
RX-	31	32	NC
GND	29	30	NC
GND	27	28	NC
TX-	25	26	GND
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

2.9.2 InnoAGE™ mSATA pin header definition



Pin header 1 is assigned for trigger PC reset function, while the OS recovery is finished, it will be automatically send commend to notify PC to re-boot power. In addition, InnoAGE™ SSD reserves external GPIO pins to connect with system for customized application. Pin header 2 is design for connecting with daughter board from SPI to Ethernet. See table 9 and 10.

Table 9: Innodisk InnoAGE™ mSATA 3TI7 Pin Header 1 Assignment

SSD control MB reset	MB control SSD Recovery	MB Power status LED pin	MB SSD status LED pin	SSD control MB power button (Optional)
H1/Pin 1	H1/Pin 3	H1/Pin 5	H1/Pin 7	H1/Pin 9
H1/Pin 2	H1/Pin 4	H1/Pin 6	H1/Pin 8	H1/Pin 10
GND	GND	GND	GND	GND

Pin	Function	Direction	Notification
1	RC_RST*	O	Active low

	GPIO	I/O	Bi-direction, function programmable
3	Recovery*	I	Active low
	GPIO	I/O	Interrupt-capable and bi-direction, function programmable
5	GPIO	I/O	Bi-direction, function programmable
	TX	O	TX of UART, pair with pin 7
7	GPIO	I/O	Bi-direction, function programmable
	RX	I	RX of UART, pair with pin 5
9	GPIO	I/O	Interrupt-capable and bi-direction, function programmable
	PWM	O	PWM control, frequency/duty TBD
2/4/6/8/10	GND		System GND
* Default setting function V_O range: -0.28<V_{OL}<0.4; 2.4<V_{OH}<3.63 (V) V_I range: -0.28<V_{IL}<0.28; 2.0<V_{IH}<3.63 (V)			

Table 10: Innodisk InnoAGE™ mSATA 3TI7 Pin Header 2 Assignment

INT	MISO	CLK	RST	GND
H2/Pin 1	H2/Pin 3	H2/Pin 5	H2/Pin 7	H2/Pin 9
H2/Pin 2	H2/Pin 4	H2/Pin 6	H2/Pin 8	H2/Pin 10
NC	NC	MOSI	CS	3.3V

Pin	Function	Direction	Notification
1	INT*	I	Interrupt-capable GPIO
	PWM	O	PWM control, frequency/duty TBD
	GPIO	I/O	Bi-direction, function programmable
3	MISO*	I	MISO of SPI interface, pair with pin 5/6/8
	DATA	I/O	CLK of I2C interface, pair with pin5
	RX	I	RX of UART, pair with pin 5/6/8
	GPIO	I/O	Bi-direction, function programmable
5	CLK*	O	CLK of SPI interface, pair with pin 3/6/8
	TX	O	TX of UART, pair with pin 3/6/8
	GPIO	I/O	Bi-direction, function programmable
6	MOSI*	O	MOSI of SPI interface, pair with pin 3/5/8
	CLK	I/O	CLK of I2C interface, pair with pin 3
	RTS	O	RTS of UART, pair with pin 3/5/8
	GPIO	I/O	Bi-direction, function programmable
7	RST	I	SSD module reset pin, active low
8	CS*	O	CS of SPI interface, pair with pin 3/5/6

	CTS	I	CST of UART, pair with pin 3/5/6
	GPIO	I/O	Bi-direction, function programmable
10	3V3		System power 3.3V
9	GND		System GND
2/4	NC		No internal connection

* Default setting function

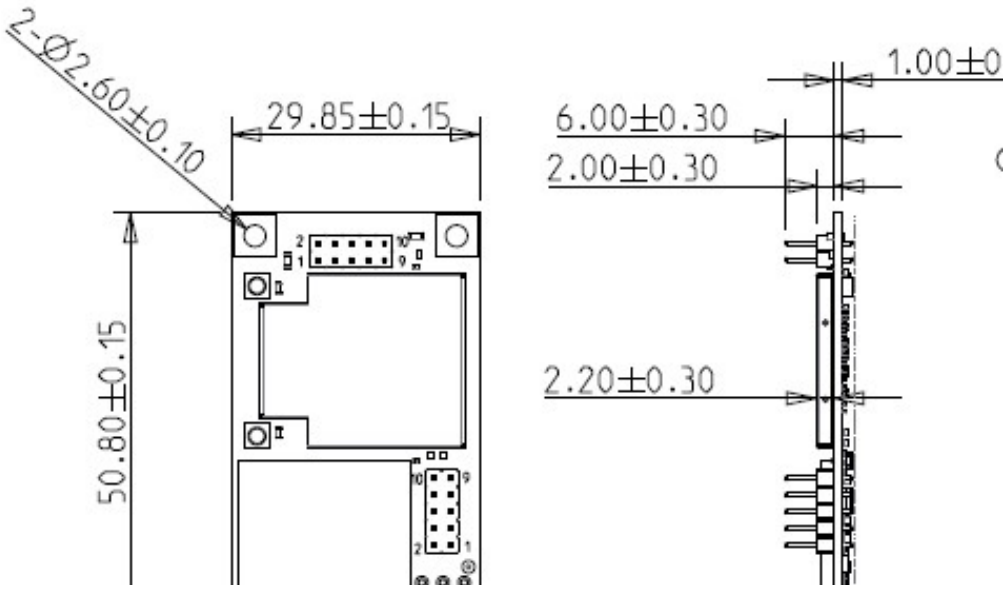
V_O range: $-0.28<V_{OL}<0.4$; $2.4<V_{OH}<3.63$ (V)

V_I range: $-0.28<V_{IL}<0.28$; $2.0<V_{IH}<3.63$ (V)

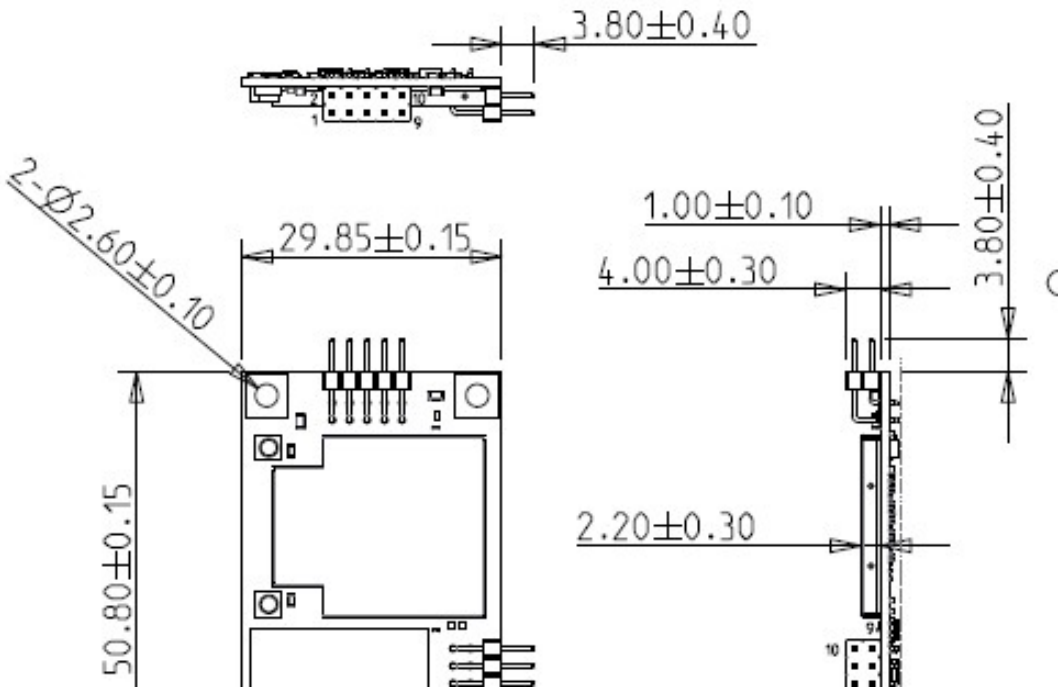
2.10 Mechanical Dimensions

2.10.1 InnoAGE™ mSATA

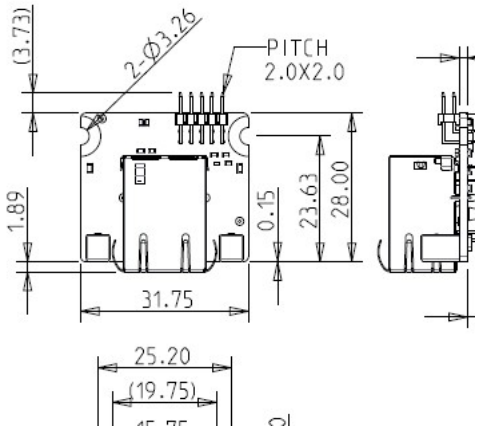
Vertical



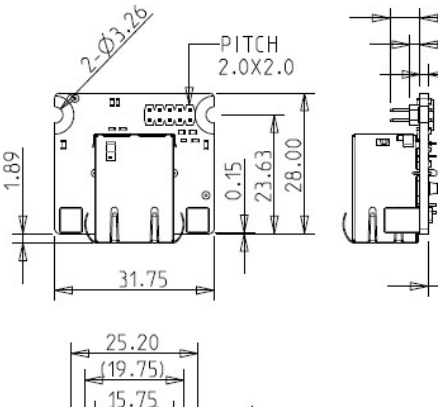
Right Angle



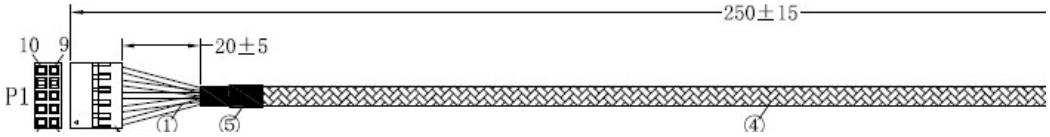
2.10.2 Ethernet Daughter Board



Horizontal Type



Vertical Type



Cable Connection to Ethernet Daughter Board

2.11 Assembly Weight

An Innodisk InnoAGE mSATA 3TI7 within flash ICs, 32GB's weight is 8 grams approximately.

2.12 Seek Time

Innodisk InnoAGE mSATA 3TI7 is not a magnetic rotating design. There is no seek or rotational latency required.

2.13 NAND Flash Memory

Innodisk InnoAGE mSATA 3TI7 uses 3D TLC NAND flash memory, with 3,000 program & erase cycles, which is non-volatility, high reliability and high speed memory storage.

3. Theory of Operation

3.1 Overview

Figure 1 shows the operation of Innodisk InnoAGE mSATA 3TI7 from the system level, including the major hardware blocks.

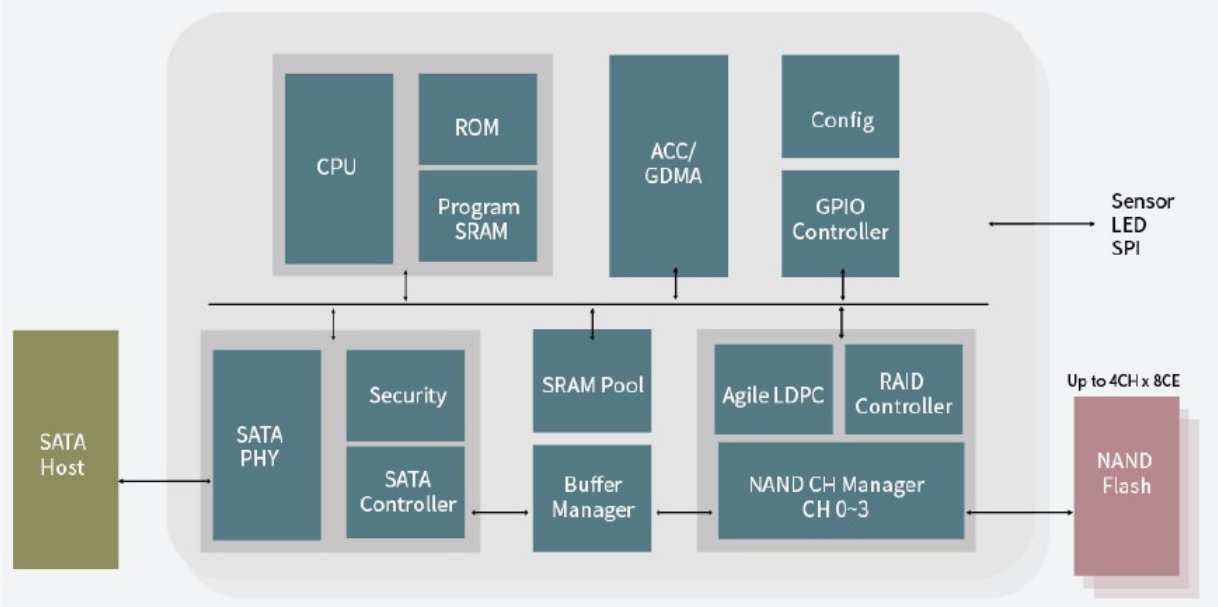


Figure 2: Innodisk InnoAGE mSATA 3TI7 Block Diagram

Innodisk InnoAGE mSATA 3TI7 integrates a SATA III controller and NAND flash memories. Communication with the host occurs through the host interface, using the standard ATA protocol. Communication with the flash device(s) occurs through the flash interface.

3.2 SATA III Controller

Innodisk InnoAGE mSATA 3TI7 is designed with a SATA III 6.0Gbps (Gen. 3) controller. The Serial ATA physical, link and transport layers are compliant with Serial ATA Gen 1, Gen 2 and Gen 3 specification (Gen 3 supports 1.5Gbps/3.0Gbps/6.0Gbps data rate). The controller has 4 channels for flash interface.

3.3 MCU

Innodisk InnoAGE mSATA 3TI7 is with out-of-band signaling, which is integrated MCU to separate connection channel. This independent communication channel is assuring constant access, InnoAGE mSATA 3TI7 is always ready for user to remotely control such as recovery, backup, and

secure erase without depending on the reset of the system being functional.

InnoAGE mSATA 3TI7 is embedded Azure Sphere to implement out-of-band function. Azure Sphere is Microsoft-designed MCU intended for use in IOT devices. Functioning as a system itself, the Azure Sphere runs the Azure Sphere OS, which allows the device to operate independently of the host device's OS. To ensure that device remains fully protected against external threats such as unauthorized access attempts, Microsoft has created a powerful security suite to ensure device integrity ad to protect the hardware form malicious actors. The security provided by the Azure Sphere also encompasses secure and encrypted access to Azure Cloud services.

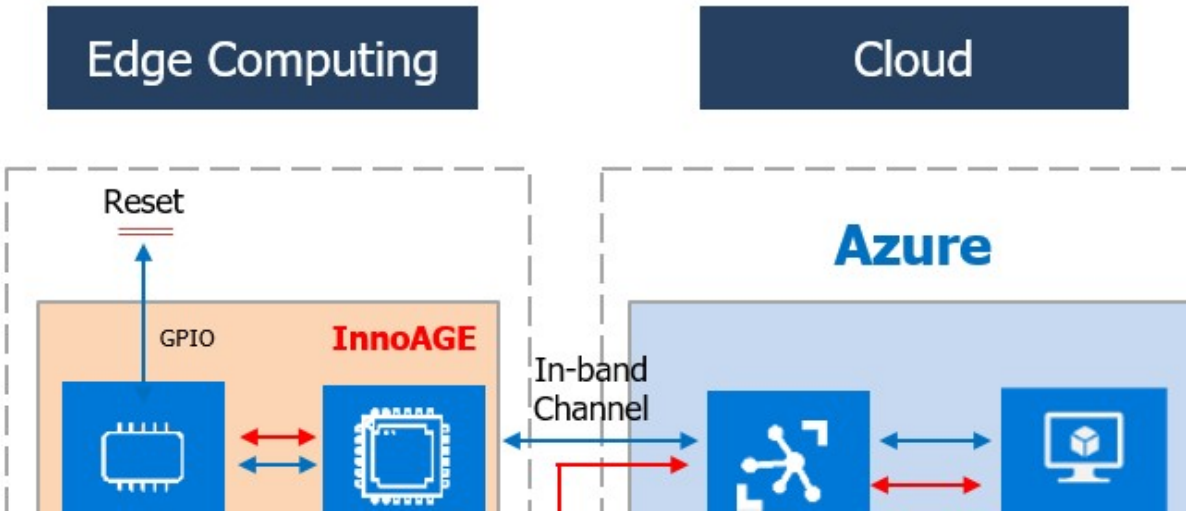


Figure 3: Edge to Azure Cloud System Architecture

InnoAGE support out of band feature in private cloud also by MQTT Broker. User can setup Sever for InnoAGE and take Server's IP as static IP 172.16.0.10(figure 19) from AP or Router that can enable DHCP function to build up private networking. User can take the following table as reference to setup network environment for InnoAGE. And ensure the port 80(dashboard), 1883(broker),8161(service) can be used for InnoAGE.

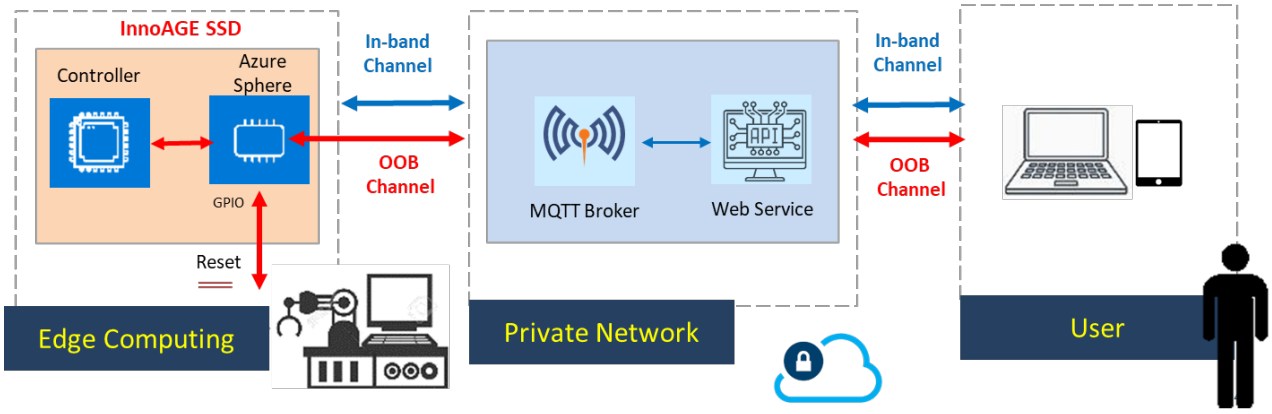


Figure 4: Edge to Private Cloud System Architecture

Property	Value
Class B	172.16.0.0 ~ 172.31.255.255
Addresses per network	65534
Server IP (InnoAGE default connect to server IP)	172.16.0.10
Ports (Web Service)	80, 1883, 8161
Gateway	255.255.0.0 (/16)

Notice: In Private cloud, InnoAGE doesn't support Azure sphere OS update and InnoAGE App OTA now.

3.4 Error Detection and Correction

Innodisk InnoAGE mSATA 3TI7 is designed with hardware LDPC ECC engine with hard-decision and soft-decision decoding. Low-density parity-check (LDPC) codes have excellent error correcting performance close to the Shannon limit when decoded with the belief-propagation (BP) algorithm using soft-decision information.

3.5 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.

Innodisk InnoAGE mSATA 3TI7 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.

3.6 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 develop 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, Bad Blocks 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.

3.7 iData Guard

Innodisk's iData Guard is a comprehensive data protection mechanism that functions before and after a sudden power outage to SSD. Low-power detection terminates data writing before an

abnormal power-off, while table-remapping after power-on deletes corrupt data and maintains data integrity. Innodisk's iData Guard provides effective power cycling management, preventing data stored in flash from degrading with use.

3.8 Garbage Collection

Garbage collection is used to maintain data consistency and perform continual data cleansing on SSDs. It runs as a background process, freeing up valuable controller resources while sorting good data into available blocks, and deleting bad blocks. It also significantly reduces write operations to the drive, thereby increasing the SSD's speed and lifespan.

3.9 Trim

The Trim command is designed to enable the operating system to notify the SSD which pages no longer contain valid data due to erases either by the user or operating system itself. During a delete operation, the OS will mark the sectors as free for new data and send a Trim command to the SSD to mark them as not containing valid data. After that the SSD knows not to preserve the contents of the block when writing a page, resulting in less write amplification with fewer writes to the flash, higher write speed, and increased drive life.

3.10 iPower Guard

iPower Guard technology is a set of preventive measures that protect the SSD in an unstable power supply environment. This comprehensive package comprises safeguards for startup and shutdown to maintain device performance and ensure data integrity.

3.11 Die RAID

Die RAID is a controller function which leveraged user capacity to back up the data in NAND flash. Die RAID supported can ensure the user data in the NAND Flash more consistent in certain scenario. Innodisk InnoAGE mSATA 3TI7 series is default enable the Die RAID function for the industrial application.

3.12 FW Recovery Function*1

InnoAGE SSD has one drive partition dedicated to recovery, meaning that recovery image for the device OS is available at all time. User can set a partition to install backup*1 image in advance. While the master boot-up area is crashed, the recovery command would designate the partition with backup image to recovery the mast boot-up partition. When the execution of recovery is finished, FW will send the PC reset*2 command to the system automatically. This function can be triggered remotely through both in-band and out-of-band channels to rapidly restore edge system.

It is independent OS and platform to recovery system due to LBA movement.

*1. The implementation of recovery and backup can refer to user guide of APP tool.

*2. User MUST to connect the PC reset pin to the pin header 1 of InnoAGE SSD (See table 9).

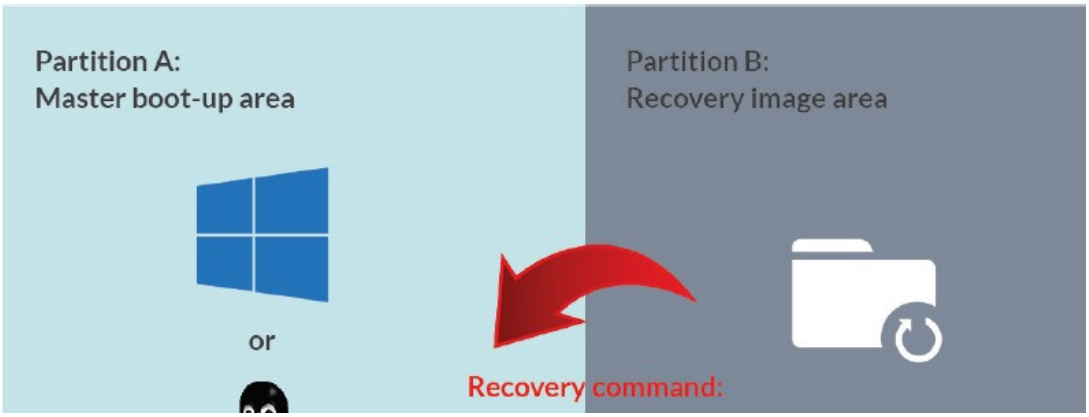


Figure 5: InnoAGE SSD partitioned for future recovery purposes

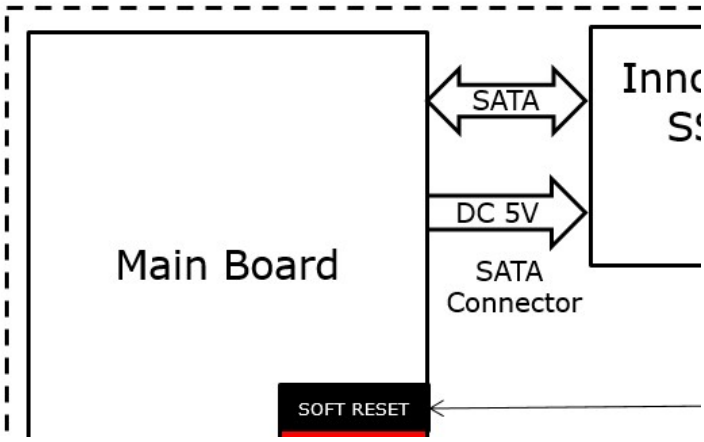


Figure 6: PC reset pin connection to InnoAGE SSD Block Diagram

3.13 Intuitive Management Platform*

InnoAGE SSD can be presented through a simple browser-based user interface; the information is easily accessible for all users, regardless of factors such as device and location. By establishing thresholds for pertinent parameters, for example temperature or the number of SSD write cycles, the management system also offers predictability, which in turn makes it easier to plan future work on the system's deices.

* The implementation of management platform can refer to user guide of APP tool.

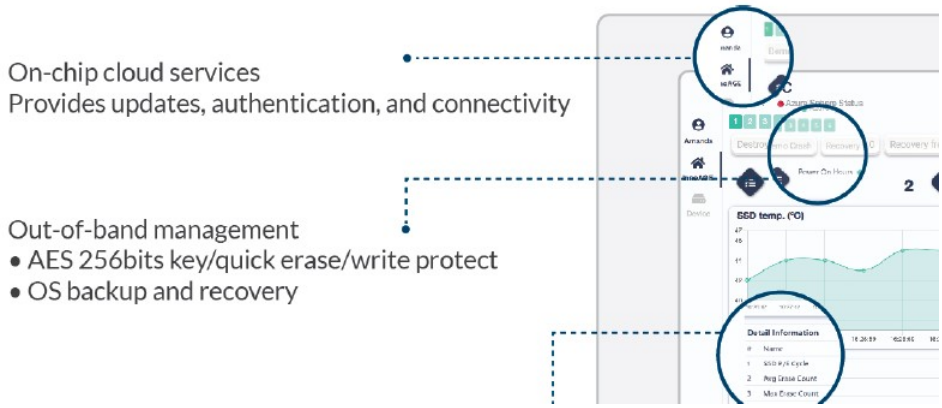


Figure 7: Screenshot of InnoAGE SSD management platform

4. Installation Requirements

4.1 InnoAGE mSATA 3TI7 Pin Directions

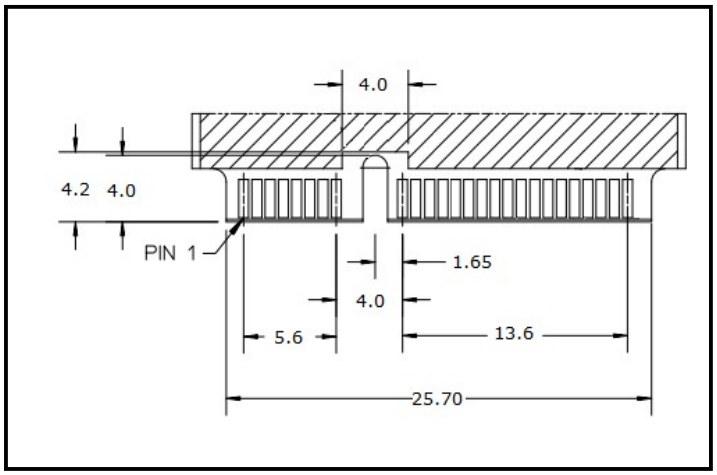


Figure 8: Signal Segment and Power Segment

4.2 Electrical Connections for InnoAGE mSATA 3TI7

A Serial ATA device may be either directly connected to a host or connected to a host through an adaptor card. The SATA interface has a separate connector for the power supply. Please refer to the pin description for further details.

4.3 Device Drive

No additional device drives are required. The Innodisk InnoAGE mSATA 3TI7 can be configured as a boot device.

5. SMART Feature Set

Innodisk 3TI7 series support the SMART command set and defines some vendor-specific data to report SMART attributes of SSD.

Table 11: SMART command

Value	Command	Value	Command
D0h	Read Data	D5h	Read Log
D1h	Read Attribute Threshold	D6h	Return Status
D2h	Enable/Disable Auto save	D8h	Enable SMART Operations
D3h	Save Attribute Values	D9h	Disable SMART Operations
D4h	Execute OFF-LINE Immediate	DAh	Return Status

5.1 SMART Attributes

Innodisk 3TI7 series SMART data attributes are listed in following table.

Table 12: SMART attribute

Attribute ID (hex)	Value	Raw Attribute Value						Rsv	Attribute Name
01	X								Read Error Rate
05	X	LSB	MSB	00	00	00	00	00	Later Bad
09	LSB	LSB	MSB	00	00	00	00	00	Power-On hours Count
0C	LSB	LSB	MSB	00	00	00	00	00	Drive Power Cycle Count
A3	X	LSB			MSB	00	00	00	Total Bad Block Count
A5	LSB	LSB			MSB	00	00	00	Max Erase count
A7	LSB	LSB			MSB	00	00	00	Avg Erase count
A9	LSB	LSB	00	00	00	00	00	00	Device Life
AA	X	LSB	MSB	00	00	00	00	00	Spare Block Count
AB	LSB	LSB	MSB	00	00	00	00	00	Program fail count
AC	LSB	LSB	MSB	00	00	00	00	00	Erase fail count
C0	LSB	LSB	MSB	00	00	00	00	00	Unexpected Power Loss Count

C2	LSB			MIN		MAX	00	00	Temperature
E5		ID 0	ID 1	ID 2	ID 3	ID 4	ID 5		Flash ID
EB			**MSB**	**LSB**	**MSB**	**LSB**	**MSB**	**LSB**	Later bad block info (**Read**/**Write**/**Erase**)
F1	00	LSB			MSB	00	00	00	Total LBA written(LBA=32MB)
F2	00	LSB			MSB	00	00	00	Total LBA read(LBA=32MB)

6. Part Number Rule

CODE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	D	T	M	S	R	-	6	4	G	D	K	1	E	C	A	Q	L	1	0	G	-	X	X	X

Definition	
Code 1st (Disk)	**Code 13th (Flash Mode)**
D : Disk	E: Supported in Azure Cloud (IOT Hub)
	J: Supported in Private Cloud (MQTT)
Code 2nd (Feature Set)	**Code 14th (Operation Temperature)**
T: InnoAGE	C: Standard Grade (0℃~ +70℃)
Code 3rd~ 5th (Form Factor)	
MSR: mSATA Regular	**Code 15th (Internal control)**
	A: Equipped with Wi-Fi Antenna
Code 7th ~9th (Capacity)	B: Equipped with Ethernet Daughter Board
32G: 32GB	**Code 16th (Channel of data transfer)**
64G: 64GB	S: Single Channel
A28: 128GB	D: Dual Channels
B56: 256GB	Q: Quad Channels
	Code 17th (Flash Type)
	L: Innodisk 3D TLC
Code 10th ~12th (Controller)	**Code 18th~20th (OS backup capacity)**
DK1: SATA 3TI7	10G: 10GB for OS backup area
	20G: 20GB for OS backup area
	30G: 30GB for OS backup area
	40G: 40GB for OS backup area
	50G: 50GB for OS backup area

7. Appendix

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宜鼎國際股份有限公司
Innodisk Corporation

Tel:(02)7703-3000 Fax:(02)

RoHS 自我宣告書(RoHS Declaration of

Manufacturer Product: All Innodisk EP pro

一、 宜鼎國際股份有限公司（以下稱本公司）特此保證售予貴公
2011/65/EU 及(EU) 2015/863 關於 RoHS 之規範要求。

Innodisk Corporation declares that all products sold to
European Union RoHS Directive (2011/65/EU) and (EU) 2

二、 本公司同意因本保證書或與本保證書相關事宜有所爭議時，

Innodisk Corporation agrees that both parties shall se
or in connection with this Declaration of Conformity

Name of hazardous substance	Limited of RoHS
鉛（Pb）	< 1000 ppm
汞（Hg）	< 1000 ppm
鎘（Cd）	< 100 ppm
六價鉻（Cr 6+）	< 1000 ppm
多溴聯苯（PBBs）	< 1000 ppm
多溴二苯醚（PBDEs）	< 1000 ppm
鄰苯二甲酸二(2-乙基己基)酯（DEHP）	< 1000 ppm
鄰苯二甲酸丁酯苯甲酯（BBP）	< 1000 ppm
鄰苯二甲酸二丁酯（DBP）	< 1000 ppm

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宜鼎國際股份有限公司
Innodisk Corporation

Tel:(02)7703-3000 Fax:(02) 7703-3

REACH Declaration of Confo

Manufacturer Product: All Innodisk EM Flash

1. 宜鼎國際股份有限公司（以下稱本公司）特此保證此售予貴公
法案(Registration , Evaluation and Authorization of Chemica
以及附錄 XIV 中的限用物質之規定 (http://www.echa.europ
last updated: 12/01/2017，SVHC's 173)。
所提供之產品包含：(1) 產品或產品所使用到的所有原物料
及重工過程中所使用到的所有原物料。

We Innodisk Corporation hereby declare that our products ar
requirements according to the (EC) No 1907/2006 REACH Re
substances in Annex XIV (http://www.echa.europa.eu/de/c
last updated: 12/01/2017，SVHC's 173).
Products include： 1) Product and raw material used by the
material ；3) Raw material used in the process of design, pr

2. 本公司同意因本保證書或與本保證書相關事宜有所爭議時，

CE

VERIFICATION OF COMPL

This Verification of Compliance is hereby issued to the below n
results of this report relate only to the tested sample identified

Technical Standard: EMC DIRECTI (EN55022

General Information

Applicant: Innodisk Corporation
5F., No. 237, Sec. 1, Datong Rd., Xizhi Dist.,
New Taipei City 22161, Taiwan (R.O.C)

Product Description

EUT Description: mSATA
Brand Name: Innodisk
Model Number: mSATA 3$*#-&
$:Flash type: (S:SLC, I:iSLC, M:MLC, T:3D TLC)
*:Product line: (E:Embedded, G:EverGreen, R:InnoRobu
#:Product Generation: (empty, 0~9)
&:Product line: (empty, P:Plus)

Measurement Standard

EN 55022: 2010 / AC: 2011
EN 61000-3-2: 2014
EN 61000-3-3: 2013
EN 55024: 2010 + A1: 2015
(IEC 61000-4-2: 2008; IEC 61000-4-3: 2006 + A1: 2007 + A2: 2010; IEC
IEC 61000-4-5: 2014; IEC 61000-4-6: 2013; IEC 61000-4-8: 2009; IEC

CE

VERIFICATION OF COMPL

This Verification of Compliance is hereby issued to the below r
results of this report relate only to the tested sample identified

Technical Standard: EMC DIRECT
(EN5

General Information

Applicant: Innodisk Corporation
5F., No. 237, Sec. 1, Datong Rd., Xizhi Dist.,
New Taipei City 22161, Taiwan (R.O.C)

Product Description

EUT Description: mSATA
Brand Name: Innodisk
Model Number: mSATA 3$*#-&
$:Flash type: (S:SLC, I:iSLC, M:MLC, T:3D TLC)
*:Product line: (E:Embedded, G:EverGreen, R:InnoRc
#:Product Generation: (empty, 0~9)
&:Product line: (empty, P:Plus)

Measurement Standard

EN 55032: 2012 / AC: 2013
CISPR 32: 2012

VERIFICATION OF COMPL

This Verification of Compliance is hereby issued to the below
results of this report relate only to the tested sample identified

Technical Standard: FCC Part
IC ICES-0

General Information

Applicant: Innodisk Corporation
5F., No. 237, Sec. 1, Datong Rd., Xizhi Dist.,
New Taipei City 22161, Taiwan (R.O.C)

Product Description

EUT Description: mSATA
Brand Name: Innodisk
Model Number: mSATA 3$*#-&
$:Flash type: (S:SLC, I:iSLC, M:MLC, T:3D TLC)
*:Product line: (E:Embedded, G:EverGreen, R:InnoRol
#:Product Generation: (empty, 0~9)
&:Product line: (empty, P:Plus)

Measurement Facilities

MSL Declaration of Conforr

1. Purpose: MSL (Moisture Sensitivity Levels) specification
   products
2. Scope: For All Innodisk finish goods
3. Responsibilities: QA
4. Reference:
   4.1 JEDEC, S-STD-020
   4.2 JEDEC,J-STD-033
5. Description
   5.1 Innodisk Products Level: All Innodisk products meet I
   5.2 Floor Life Time: Refer following table

		Soak Requirements		
	Floor Life		Standard	
Level	Time	Cond degC/%RH	Time (hrs)	Cond degC/%RH
1	unlimited	<=30/85%	168+5/-0	85/85
2	1 year	<=30/60%	168+5/-0	85/60
2a	4 weeks	<=30/60%	696+5/-0	30/60
3	168 hours	<=30/60%	192+5/-0	30/60