innodisk

Total Solution For
Industrial Flash Storage

SATADOM-ML

3IS4 Series

Customer: _____

Customer Part Number: _____

Innodisk Part Number: _____

Innodisk Model Name: _____

Date: _____

Innodisk Approver	Customer Approver

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Revision History

Revision	Description	Date
V1.0	First Released	Apr., 2017
V1.1	Edited content.	Sep., 2017
V1.2	Update Product Photo & Mechanical Drawing	Apr., 2024

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1. Product Overview

1.1 Introduction of Innodisk SATADOM-ML 3IS4

Innodisk SATADOM-ML 3IS4 is characterized by L^3 architecture with the latest SATA III (6.0GHz) Marvell NAND controller. Innodisk's exclusive L^3 architecture is L^2 architecture multiplied LDPC (Low Density Parity Check). L^2 (Long Life) architecture is a 4K mapping algorithm that reduces WAF and features a real-time wear leveling algorithm to provide high performance and prolong lifespan with exceptional reliability.

Innodisk SATADOM-ML 3IS4 is designed for server field. The height of the SATADOM suit for 1U(44.5mm) server, allow it to fit seamlessly into any server setup. Besides, the main benefit is going to be the ability to use a SATA boot device without using a drive bay.

1.2 Product View and Models

Innodisk SATADOM-ML 3IS4 is available in 16GB, 32GB, 64GB, 128GB capacities within iSLC* flash .

Figure 1: Innodisk SATADOM-ML 3IS4

1.3 SATA Interface

Innodisk SATADOM-ML 3IS4 delivers high performance and reliability by SATA III interface and backward compatibility with SATA I and SATA II. Sequential read speeds up to 540 MB/s and Sequential write speeds up to 400 MB/s. Also delivers Random 4K Read speeds up to 31,000 IOPS and Random 4K Write speeds up to 32,00IOPS.

1.4 Key Features

- Designed to fit 1U server chassis
- Pin7 / Pin8 power supply implement
- Low power consumption

- Thermal sensor
- Power loss protection with iData Guard™

1.5 Benefits of Server Boot-up Series

- Firmware optimized for server application
- Windows Server 2016 certified
- Linux Server OS verified*
  - Red Hat Enterprise Linux Server V7.3
  - Ubuntu V16.04
  - CentOS V7
  - Fedora V25
  - OpenSUSE V13.2
- Virtual machine applications verified*
  - VMware EXSi V6.5
  - Hyper-V (Windows Server 2016)
  - Oracle VM Server/ VM Manager
- iSMART supported
  - VMware
  - Windows Server Series OS
  - Linux Series OS

*** For the details of Linux OS and VM application please connect Innodisk for the Test Report.**

2. Product Specifications

2.1 Capacity and Device Parameters

SATADOM-ML 3IS4 device parameters are shown in Table 1.

Table 1: Device parameters

Capacity	Cylinders	Heads	Sectors	LBA	User Capacity(MB)
16GB	16383	16	63	31277232	15272
32GB	16383	16	63	62533296	30533
64GB	16383	16	63	125045424	61057
128GB	16383	16	63	250069680	122104

2.2 Performance

Burst Transfer Rate: 6.0Gbps

Table 2: Performance

Capacity	16GB	32GB	64GB	128GB
Sequential* Read (max.)	500 MB/s	530 MB/s	530 MB/s	540 MB/s
Sequential* Write (max.)	170 MB/s	320 MB/s	360 MB/s	400 MB/s
4KB Random** Read (QD32)	23,000 IOPS	30,000 IOPS	31,000 IOPS	31,000 IOPS
4KB Random** Write (QD32)	27,000 IOPS	30,000 IOPS	32,000 IOPS	31,000 IOPS

Note: * Sequential performance is based on CrystalDiskMark 5.1.2 with file size 1000MB

** Random performance is based on IO meter with Queue Depth 32

2.3 Electrical Specifications

2.3.1 Power Requirement

Table 3: Innodisk SATADOM-ML 3IS4 Power Requirement

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

2.3.2 Power Consumption

Table 4: Power Consumption

Mode	Power Consumption (mA)
Read	100mA (max.)
Write	171mA (max.)
Idle	82mA (max.)
Pin 7/ Pin8 VCC Initial*	1000(max.)

Target: 128GB SATADOM-ML 3IS4

***To design in Pin7/8 VCC on motherboard, 5V with 1A power supply is requested.**

2.4 Environmental Specifications

2.4.1 Temperature Ranges

Table 5: Temperature Range for SATADOM-ML 3IS4

Temperature	Range
Operating	Standard Grade: 0°C to +70°C
	Industrial Grade: -40°C to +85°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 SATADOM-ML 3IS4

Reliability	Test Conditions	Reference Standards
Vibration	7 Hz to 2K Hz, 20G, 3 axes	IEC 60068-2-6
Mechanical Shock	Duration: 0.5ms, 1500 G, 3 axes	IEC 60068-2-27

2.4.4 Mean Time between Failures (MTBF)

Table 7 summarizes the MTBF prediction results for various SATADOM-ML 3IS4 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: SATADOM-ML 3IS4 MTBF

Product	Condition	MTBF (Hours)
Innodisk SATADOM-ML 3IS4	Telcordia SR-332 GB, 25°C	>3,000,000

2.5 CE and FCC Compatibility

SATADOM-ML 3IS4 conforms to CE and FCC requirements.

2.6 RoHS and REACH Compliance

SATADOM-ML 3IS4 is fully compliant with RoHS directive.

2.7 Windows Server 2016 Compatibility

Due to the features of Innodisk SATADOM as a Boot-up drive. Microsoft announced plans to support for SATADOM devices as primary boot drives for Windows server 2016 and future Long-Term Servicing Branch (LTSC) or Semi-Annual Channel releases.

SATADOM-ML 3IS4 has passed the Windows Server 2016 WHCK/WHQL test. They are certified for the Windows Server 2016 operating system and are fully supported in the Hyper-V environment.

2.8 Reliability

Table 8: SATADOM-ML 3IS4 TBW

Parameter	**Value**		
Read Cycles	Unlimited Read Cycles		
Flash endurance	20,000 P/E cycles		
Wear-Leveling Algorithm	Support		
Bad Blocks Management	Support		
Error Correct Code	Support		
TBW* (Total Bytes Written) Unit: TB			
Capacity	**Sequential workload**	**Client workload**	**Enterprise workload**
16GB	312.5	208.3	19.5
32GB	625	416.7	39
64GB	1250	833.3	78.1
128GB	2500	1388.9	156.2
DWPD(5years)	10.96	7.3	0.68

* 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. Enterprise: Follow JESD218 Test method and JESD219A Workload, tested by Vdbench.
4. Based on out-of-box performance.

2.9 Transfer Mode

SATADOM-ML 3IS4 support following transfer modes:

Serial ATA I 1.5Gbps

Serial ATA II 3.0Gbps

Serial ATA III 6.0Gbps

2.10 Pin Assignment

Innodisk SATADOM-ML 3IS4 uses a standard SATA pin-out. See Table 9 for SATADOM-ML 3IS4 pin assignment.

Table 9: Innodisk SATADOM-ML 3IS4 Pin Assignment

Name	Type	Description
Pin 0	GND	Shielding
Pin 1	GND	Shielding
Pin 2	A+	Differential signal to A
Pin 3	A-	Differential signal to A-
Pin 4	GND	Shielding
Pin 5	B-	Differential signal to B-
Pin 6	B+	Differential signal to B
Pin 7	GND/ Vcc*	Shielding/ +5V Power*
Pin 8	VCC	+5V Power

*** SATADOM-ML 3IS4 default power supply through pin 8 or extra power cable.**

Pin 7 power supply as an optional function with separated PN end of B.

2.11 Mechanical Dimensions

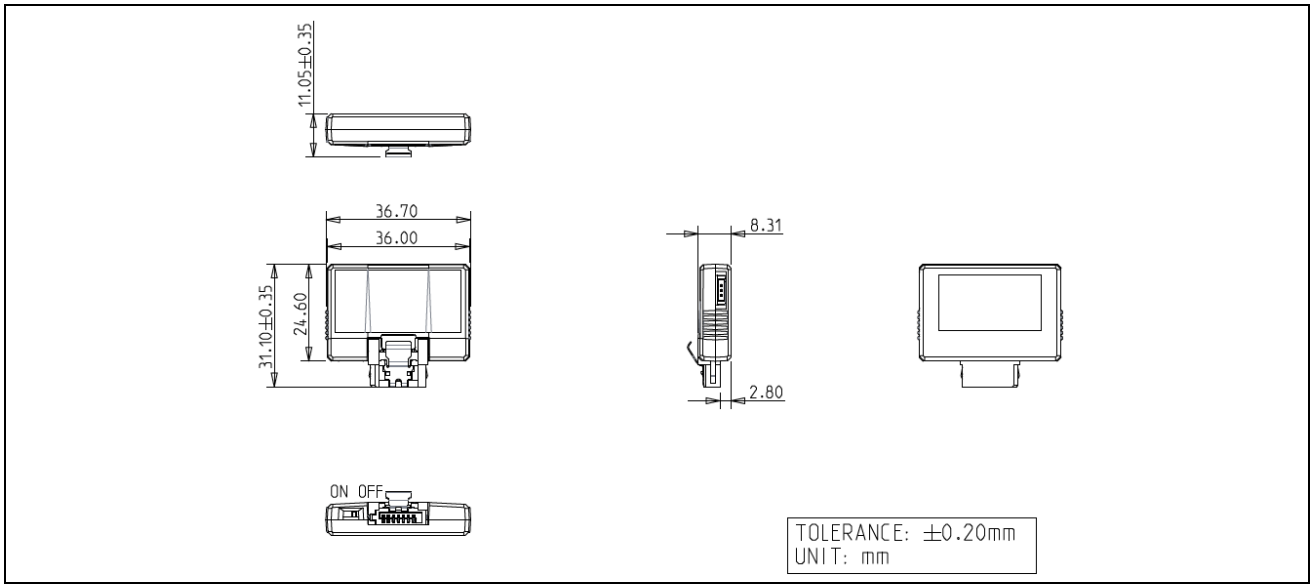

Figure 2: Innodisk SATADOM-ML 3IS4 Mechanical Diagram

2.12 Assembly Weight

An Innodisk SATADOM-ML 3IS4 within flash ICs, 32GB's weight is 7 grams approximately.

2.13 Seek Time

Innodisk SATADOM-ML 3IS4 is not a magnetic rotating design. There is no seek or rotational latency required.

2.14 Hot Plug

The SSD support hot plug function and can be removed or plugged-in during operation. User has to avoid hot plugging the SSD which is configured as boot device and installed operation system.

Surprise hot plug : The insertion of a SATA device into a backplane (combine signal and power) that has power present. The device powers up and initiates an OOB sequence.

Surprise hot removal: The removal of a SATA device from a powered backplane, without first being placed in a quiescent state.

2.15 iSLC

Innodisk SATADOM-ML 3IS4 uses Multi Level Cell (MLC) NAND flash memory to act as SLC flash by in-house firmware. iSLC is our exclusive technology designed to ensure longer-lasting and more reliable performance than conventional MLC NAND flash. Through the use of flash management algorithms, iSLC improves SSD endurance up to 20,000 cycles, increasing the lifespan to at least seven times longer than MLC-based solutions.

3. Theory of Operation

3.1 Overview

Figure 3 shows the operation of Innodisk SATADOM-ML 3IS4 from the system level, including the major hardware blocks.

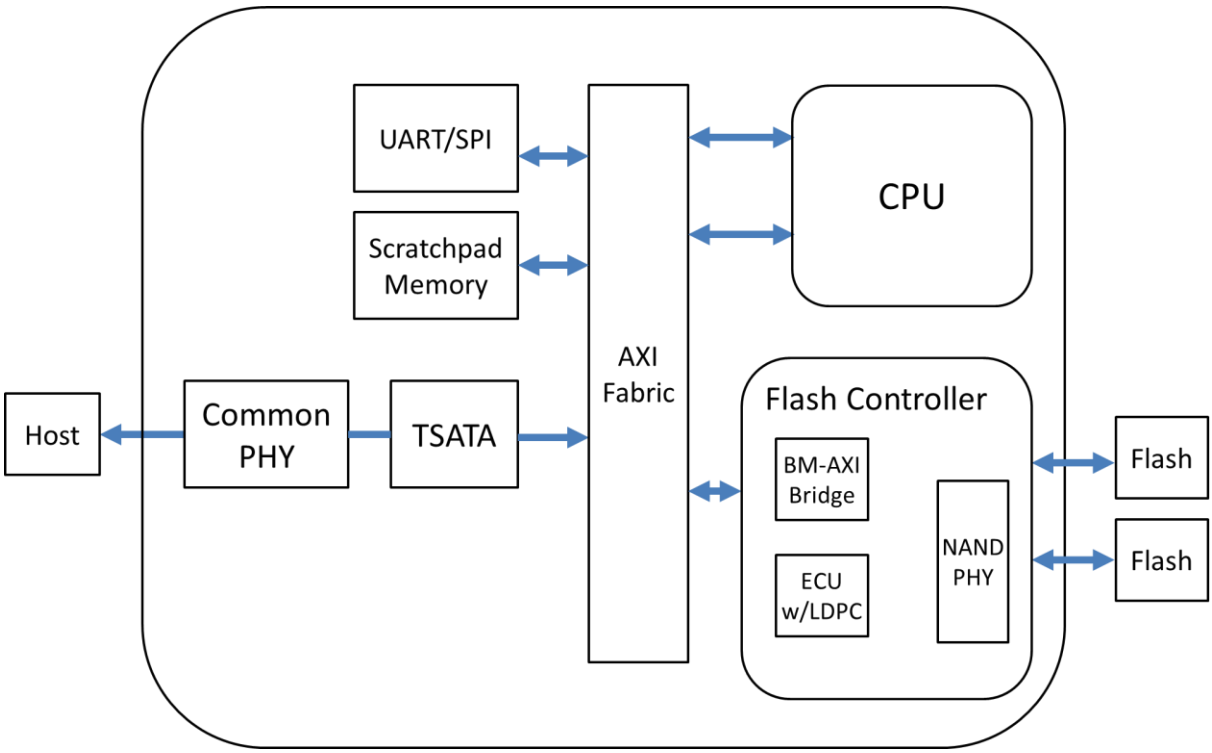

Figure 3: Innodisk SATADOM-ML 3IS4 Block Diagram

Innodisk SATADOM-ML 3IS4 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 SATADOM-ML 3IS4 is designed with Marvell Artemis, 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 2 channels for flash interface.

3.3 Error Detection and Correction

Innodisk SATADOM-ML 3IS4 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.

3.4 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 SATADOM-ML 3IS4 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.

In Server Boot-up series, Innodisk has implemented another exclusive FW algorithm in wear-leveling. In some special boot drive applications, may have a lot of read but less write. This algorithm is able to prevent a read disturber and decrease ECC.

3.5 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.

3.6 iData Guard™

Innodisk's iData Guard™ is a comprehensive data protection mechanism that functions before and after a sudden power outage to the 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.

3.7 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.

3.8 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.

4. Installation Requirements

4.1 SATADOM-ML 3IS4 Pin Directions

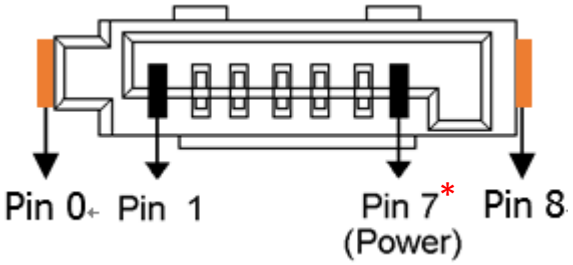

Figure 4: Signal Segment and Power Segment

*** SATADOM-ML 3IS4 default power supply through pin 8 or extra power cable.**

Pin 7 power supply as an optional function with separate PN end of B.

4.2 Electrical Connections for SATADOM-ML 3IS4

A Serial ATA device may be either directly connected to a host or connected to a host through a cable. For connection via cable, the cable should be no longer than 1 meter. 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 SATADOM-ML 3IS4 can be configured as a boot device.

4.4 Power Supply for SATADOM

4.4.1 Power Cable

A power cable is shipped with each SATADOM product, which has standard 4 pins power connector and special 3 pins power connector for SATADOM. The male and female power connector of SATADOM have foolproof design to avoid misconnection, please check it before power on. Innodisk also can customize the power connector for different host power socket design.

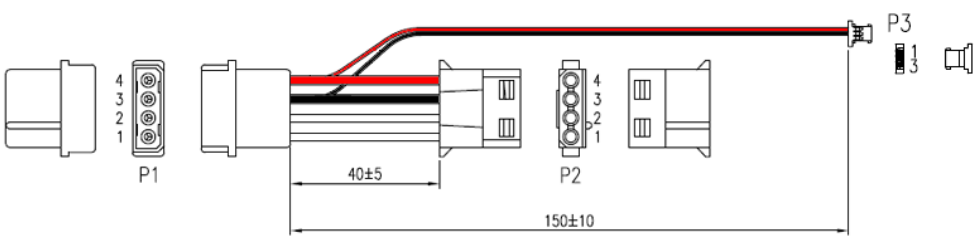

Figure 5: Standard Power cable

4.4.2 Pin8 and Pin7 VCC

Innodisk's SATADOM SSDs provide an elegant, compact option for SSD storage in embedded systems, industrial PCs and server motherboards with their small form factor that connects directly to the SATA connector on the motherboard. This simplified SSD design not only frees up a precious drive bay for other storage options but eliminates messy, obtrusive SATA data cabling. Innodisk's patented Pin7 and Pin 8 SATA Power technologies take the cable-less concept to the next step by also eliminating the need for power cables for a 100% cable-less, shock resistant, space saving plug-and-play storage solution that optimizes airflow and makes the best use of limited board space in embedded and rackmount server systems.

SATADOM-ML 3IS4 series with Pin8/Pin7 VCC, it is defined Pin8/Pin7 as VCC on the SATA connector. Thus the power would come from SATA connector Pin8/Pin7 VCC. Customers DO NOT have to use the power cable for power supply. Such a cable-less design of SATADOM-ML 3IS4 series with Pin8/Pin7 VCC brings more convenience to customers' system. The followings are the points customers have to be careful of while designing in SATADOM-ML 3IS4 series with Pin8/Pin7 VCC.

When customers use SATADOM with Pin8/Pin7 VCC and the host SATA socket does not have power on Pin8/Pin7, external power must be provided to the SATADOM from the 3pin connector on the side.To have the advantages of SATADOM-ML 3IS4 series with Pin8/Pin7 VCC, and to avoid any potential damage on customer's board designed with VCC power supply. Innodisk suggests that customers MUST design their board with a fuse which should be designed before the SATA socket Pin8/Pin7 VCC. In other words, customers are suggested NOT TO layout 5V VCC to SATA socket on board directly. A circuit diagram example to explain this is shown as below.

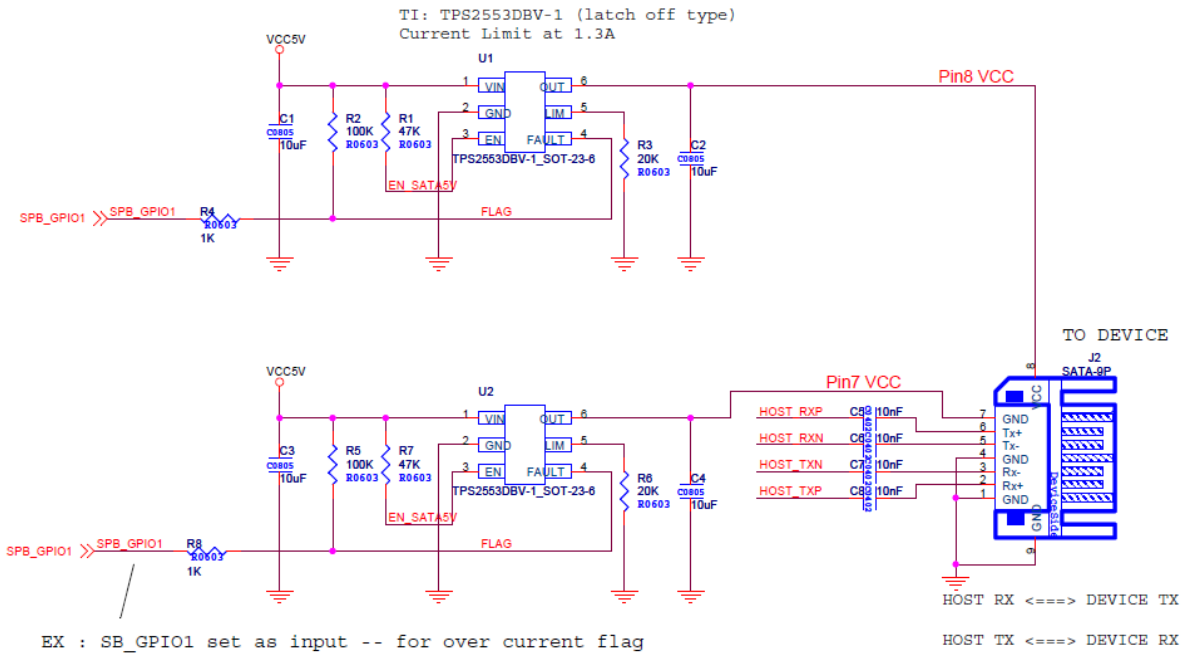

Figure 6: Pin 8 / Pin 7 Host Design In Reference Circuit

4.5 Write Protection

SATADOM-ML 3IS4 within the hardware write-protect function could prevent the device from modification and deletion. Write-protected data could only be read, that is, users could not write to it, edit it, append data to it, or delete it. When users would like to make sure that neither themselves nor others could modify or destroy the file, users could switch on write-protection. Thus, SATADOM-ML 3IS4 could process write-protect mechanism and disable flash memory to be written-in any data. Only while the system power-off, users could switch on write-protection. Write-protection could not be switched-on, after OS booting.

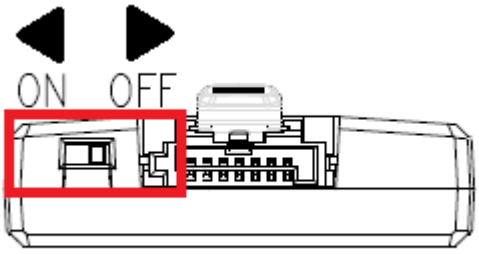

Figure 7: Hardware Write Protect Position

5. SMART Feature Set

Innodisk SATADOM-ML 3IS4 support the SMART command set to report SMART attributes of SSD. Customer also can monitor SMART value by iSMART.

5.1 iSMART

Intuitive software tool for SSD monitoring, lifetime prediction and alerts iSMART is a proprietary software developed to access the SMART attributes of Innodisk SATA devices. The software gives the user full access to all SMART related data as well as being able to monitor additional parameters through a simple and user-friendly interface In addition, the SMART attributes can be exported and further analyzed to gain a comprehensive picture of SSD health and status.

5.2 SMART Command

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

5.3 SMART Attributes

Innodisk SATADOM-ML 3IS4 SMART attributes are listed in following table.

Attribute ID (hex)	Value	Raw Attribute Value						Rsv	Attribute Name
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
	D	**S**	**S**	**M**	**L**	**-**	**3**	**2**	**G**	**M**	**4**	**1**	**3**	**C**	**A**	**D**	**C**	**A**	**X**	**X**	**X**

Definition	
Code 1st (Disk)	**Code 14th (Operation Temperature)**
D: Disk	C: Standard Grade (0℃~ +70℃)
Code 2nd (Feature set)	W: Industrial Grade (-40℃~ +85℃)
S: Server Series	**Code 15th (Internal control)**
Code 3rd ~5th (Form factor)	A~Z: BGA PCB Version
SML: SATADOM-ML	**Code 16th (Channel of data transfer)**
Code 7th ~9th (Capacity)	D: Dual Channel
16G: 16GB / 32G: 32GB / 64G: 64GB / A28: 128GB	
Code 10th ~12th (Controller)	**Code 17th (Flash Type)**
M41: 3IS4 Series	C: Toshiba MLC
	Code 18th (Power Supply Config.)
Code 13th (Flash mode)	A: Pin8 version / Power Cable
3: iSLC	B: Pin8 & Pin7 Version
	Code 19th~21st (Customization Code)

7. Appendix

CE

CE

VERIFICATION OF COMPLIANCE

This Verification of Compliance is hereby issued to the below named company. The test results of this report relate only to the tested sample identified in this report.

Technical Standard: EMC DIRECTIVE 2014/30/EU (EN55032 / EN55024)

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

Measurement Standard

EN 55032: 2012 / AC: 2013
CISPR 32: 2012
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 61000-4-4: 2012; IEC 61000-4-5: 2014; IEC 61000-4-6: 2013; IEC 61000-4-8: 2009; IEC 61000-4-11: 2004)

Measurement Facilities

Xindian Lab.: *Compliance Certification Services Inc.*
No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, 23151 Taiwan.
Tel: +886-2-22170894 / Fax: +886-2-22171029

This device has been shown to be in compliance with and was tested in accordance with the measurement procedures specified in the Standards & Specifications listed above and as indicated in the measurement report number: T170309D02-E

Sam Hu

Sam Hu / Assistant Manager
Date: March 20, 2017

CCSRF
程智科技股份有限公司
Compliance Certification Services Inc.

FCC

VERIFICATION OF COMPLIANCE

This Verification of Compliance is hereby issued to the below named company. The test results of this report relate only to the tested sample identified in this report.

Technical Standard: FCC Part 15 Class B
IC ICES-003

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

Measurement Facilities

Xindian Lab.: *Compliance Certification Services Inc.*
No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, 23151 Taiwan.
Tel: +886-2-22170894 / Fax: +886-2-22171029

This device has been shown to be in compliance with and was tested in accordance with the measurement procedures specified in the Standards & Specifications listed above and as indicated in the measurement report number: TI70309D02-D

Sam Hu / Assistant Manager
Date: March 20, 2017

程智科技股份有限公司
Compliance Certification Services Inc.

WHQL/WHCK

ALLION ISO/IEC 17025 Qualified

WHQL Compliance Test Compliance Program

Test Report

Company Name:	Innodisk Corporation
Model Name:	SATADOM-ML 3IS4
WHQL Category:	Storage
Test Start Date:	2017/3/13
Report Date:	2017/3/16
Overall Test Result:	Pass
Family Model:	SATADOM-xx 3IS4 SATADOM-xx 3IE4 xx : Family type include (SV, SH, SL, MV, MH, ML)

Project ID : SSD-IC-WHQL-002-1(*)

9F, No. 3-1, Yuan Ku Street, Taipei, Taiwan, 11543, R.O.C.
Phone: +886-2-77228800 Fax: +886-2-26557879

Document Number : AR-TRL030807 1/5

REACH

innodisk

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REACH Declaration of Conformity

Manufacturer Product: All Innodisk EM Flash and Dram products

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司之產品，皆符合歐盟化學品法案(Registration , Evaluation and Authorization of Chemicals：(EC) No 1907/2006 REACH)以及附錄 XIV 中的限用物質之規定 (http://www.echa.europa.eu/de/candidate-list-table **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；(2)包裝材料；(3)設計、生產及重工過程中所使用到的所有原物料。

   We Innodisk Corporation hereby declare that our products are in compliance with the requirements according to the (EC) No 1907/2006 REACH Regulation and restricted substances in Annex XIV (http://www.echa.europa.eu/de/candidate-list-table **last updated: 12/01/2017，SVHC's 173).**

   Products include： 1) Product and raw material used by the product；2) Packaging material ；3) Raw material used in the process of design, production and rework.

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，雙方宜友好協商，達成協議。

   InnoDisk Corporation agrees that both parties shall settle any dispute arising from or in connection with this Declaration of Conformity by friendly negotiations.

立 保 證 書 人 (Guarantor)

Company name 公司名稱： InnoDisk Corporation 宜鼎國際股份有限公司

Company Representative 公司代表人： Randy Chien 簡川勝

Company Representative Title 公司代表人職稱： Chairman 董事長

Date 日期： 2017 / 02 / 08

RoHS

innodisk

宜鼎國際股份有限公司
Innodisk Corporation

Tel:(02)7703-3000 Fax:(02) 7703-3555 Internet: http://www.innodisk.com/

RoHS 自我宣告書 (RoHS Declaration of Conformity)

Manufacturer Product: All Innodisk EM Flash and Dram products

一、 宜鼎國際股份有限公司（以下稱本公司）特此保證售予貴公司之所有產品，皆符合歐盟 2011/65/EU 及(EU) 2015/863 關於 RoHS 之規範要求。

Innodisk Corporation declares that all products sold to the company, are complied with European Union RoHS Directive (2011/65/EU) and (EU) 2015/863 requirement.

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，雙方宜友好協商，達成協議。

Innodisk Corporation agrees that both parties shall settle any dispute arising from or in connection with this Declaration of Conformity by friendly negotiations.

Name of hazardous substance	Limited of RoHS ppm（mg/kg）
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
鄰苯二甲酸二異丁酯（DIBP）	< 1000 ppm

立 保 證 書 人 (Guarantor)

Company name 公司名稱： Innodisk Corporation 宜鼎國際股份有限公司

Company Representative 公司代表人： Randy Chien 簡川勝

Company Representative Title 公司代表人職稱： Chairman 董事長

Date 日期： 2017 / 01 / 18