innodisk

Total Solution For Industrial Flash Storage

SATADOM-MH

3SE Series

Customer: _____

Customer Part Number: _____

Innodisk Part Number: _____

Innodisk Model Name: _____

Date: _____

Innodisk Approver	Customer Approver

Table of contents

LIST OF FIGURES 6

1. PRODUCT OVERVIEW 7

1.1 Introduction of Innodisk SATADOM-MH 3SE 7
1.2 Product View and Models 7
1.3 SATA Interface 7

2. PRODUCT SPECIFICATIONS 8

2.1 Capacity and Device Parameters 8
2.2 Performance 8
2.3 Electrical Specifications 8
2.3.1 Power Requirement 8
2.3.2 Power Consumption 9
2.4 Environmental Specifications 9
2.4.1 Temperature Ranges 9
2.4.2 Humidity 9
2.4.3 Shock and Vibration 9
2.4.4 Mean Time between Failures (MTBF) 9
2.5 CE and FCC Compatibility 10
2.6 RoHS Compliance 10
2.7 Reliability 10
2.8 Transfer Mode 10
2.9 Pin Assignment 11
2.10 Mechanical Dimensions 11
2.11 Assembly Weight 12
2.12 Seek Time 12
2.13 Hot Plug 12
2.14 NAND Flash Memory 12

3. THEORY OF OPERATION 13

3.1 Overview 13
3.2 SATA III Controller 13
3.3 Error Detection and Correction 14
3.4 Wear-Leveling 14
3.5 Bad Blocks Management 14
3.6 Power Cycling 14
3.7 Garbage Collection 14

4. INSTALLATION REQUIREMENTS 15

4.1 SATADOM-MH 3SE Pin Directions 15

4.2 ELECTRICAL CONNECTIONS FOR SATADOM-MH 3SE 15
4.3 WRITE PROTECTION 15
4.4 DEVICE DRIVE 16
4.5 PIN7 VCC 16
4.6 POWER CABLE 17
5. PART NUMBER RULE 18

REVISION HISTORY

Revision	Description	Date
Preliminary	First Released	April, 2014
Rev. 1.0	Modified performance	June, 2014
Rev. 1.1	MP release	July, 2014
Rev. 1.2	Modify TBW based on NAND Flash specifications	Jan., 2015
Rev. 1.3	Add 64GB Modified typo	June, 2016
Rev. 1.4	Updated Appendix	May, 2017

List of Tables

TABLE 1: DEVICE PARAMETERS 8
TABLE 2: PERFORMANCE 8
TABLE 3: INNODISK SATADOM-MH 3SE POWER REQUIREMENT 8
TABLE 4: POWER CONSUMPTION 9
TABLE 5: TEMPERATURE RANGE FOR SATADOM-MH 3SE 9
TABLE 6: SHOCK/VIBRATION TESTING FOR SATADOM-MH 3SE 9
TABLE 7: SATADOM-MH 3SE MTBF 10
TABLE 8: INNODISK SATADOM-MH 3SE PIN ASSIGNMENT 11

List of Figures

FIGURE 1: INNODISK SATADOM-MH 3SE 7
FIGURE 2: INNODISK SATADOM-MH 3SE BLOCK DIAGRAM 13
FIGURE 3: SIGNAL SEGMENT AND POWER SEGMENT 15

1. Product Overview

1.1 Introduction of Innodisk SATADOM-MH 3SE

Innodisk Serial ATA Disk on Module (SATADOM) supports SATA III standard (6.0Gb/s) interface with excellent performance, and SATADOM-MH 3SE is designed as the smallest form factor size that could enhance compatibility with various design applications. Particularly the 7th pin of standard SATA 7pin connector can optionally be the built-in power VCC pin. In other words, it could be connected directly to the SATA on-board socket on customers' system without additional power cable. Besides, the booting time for operation and the power consumption is less than hard disk drive (HDD). SATADOM-MH 3SE can work under harsh environment compile with ATA protocol, no additional drives are required, and the SSD can be configured as a boot device or data storage device.

1.2 Product View and Models

Innodisk SATADOM-MH 3SE is available in follow capacities within SLC flash ICs.

SATADOM-MH 3SE 4GB

SATADOM-MH 3SE 8GB

SATADOM-MH 3SE 16GB

SATADOM-MH 3SE 32GB

SATADOM-MH 3SE 64GB

Figure 1: Innodisk SATADOM-MH 3SE

1.3 SATA Interface

Innodisk SATADOM-MH 3SE supports SATA III interface, and compliant with SATA I and SATA II. SATA III interface can work with Serial Attached SCSI (SAS) host system, which is used in server computer. Innodisk SATADOM-MH 3SE is compliant with Serial ATA Gen 1, Gen 2 and Gen 3 specification (Gen 3 supports 1.5Gbps /3.0Gbps/6.0Gbps data rate). SATA connector uses a standard 7-pin signal segment.

2. Product Specifications

2.1 Capacity and Device Parameters

SATADOM-MH 3SE device parameters are shown in Table 1.

Table 1: Device parameters

Capacity	LBA	Cylinders	Heads	Sectors	User Capacity(MB)
4GB	7835184	7773	16	63	3,826
8GB	15649200	15525	16	63	7,641
16GB	31277232	16383	16	63	15,272
32GB	62533296	16383	16	63	30,533
64GB	125045424	16383	16	63	61,057

2.2 Performance

Burst Transfer Rate: 6.0Gbps

Table 2: Performance

Capacity	4GB	8GB	16GB	32GB	64GB
Sequential Read (max.)	200 MB/sec	210 MB/sec	260 MB/sec	260 MB/sec	130 MB/sec
Sequential Write (max.)	55 MB/sec	65 MB/sec	130 MB/sec	130 MB/sec	120 MB/sec

Note: the information is based on CrystalDiskMark 3.01 with file size 1000MB test patent

2.3 Electrical Specifications

2.3.1 Power Requirement

Table 3: Innodisk SATADOM-MH 3SE 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	360 (max.)
Write	360 (max.)
Idle	260 (max.)

* Target: 32GB SATADOM-MH 3SE

2.4 Environmental Specifications

2.4.1 Temperature Ranges

Table 5: Temperature range for SATADOM-MH 3SE

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-MH 3SE

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 SATADOM-MH 3SE 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-MH 3SE MTBF

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

2.5 CE and FCC Compatibility

SATADOM-MH 3SE conforms to CE and FCC requirements.

2.6 RoHS Compliance

SATADOM-MH 3SE is fully compliant with RoHS directive.

2.7 Reliability

Parameter	Value
Read Cycles	Unlimited Read Cycles
Wear-Leveling Algorithm	Support
Bad Blocks Management	Support
Error Correct Code	Support
TBW(Sequential Write)	
4GB	216 (Sequential write)
8GB	432 (Sequential write)
16GB	864 (Sequential write)
32GB	1728 (Sequential write)
64GB	3456 (Sequential write)

2.8 Transfer Mode

SATADOM-MH 3SE support following transfer mode:

Serial ATA III 6.0Gbps

Serial ATA II 3.0Gbps

Serial ATA I 1.5Gbps

2.9 Pin Assignment

Innodisk SATADOM-MH 3SE uses a standard SATA pin-out. See Table 8 for SATADOM-MH 3SE pin assignment.

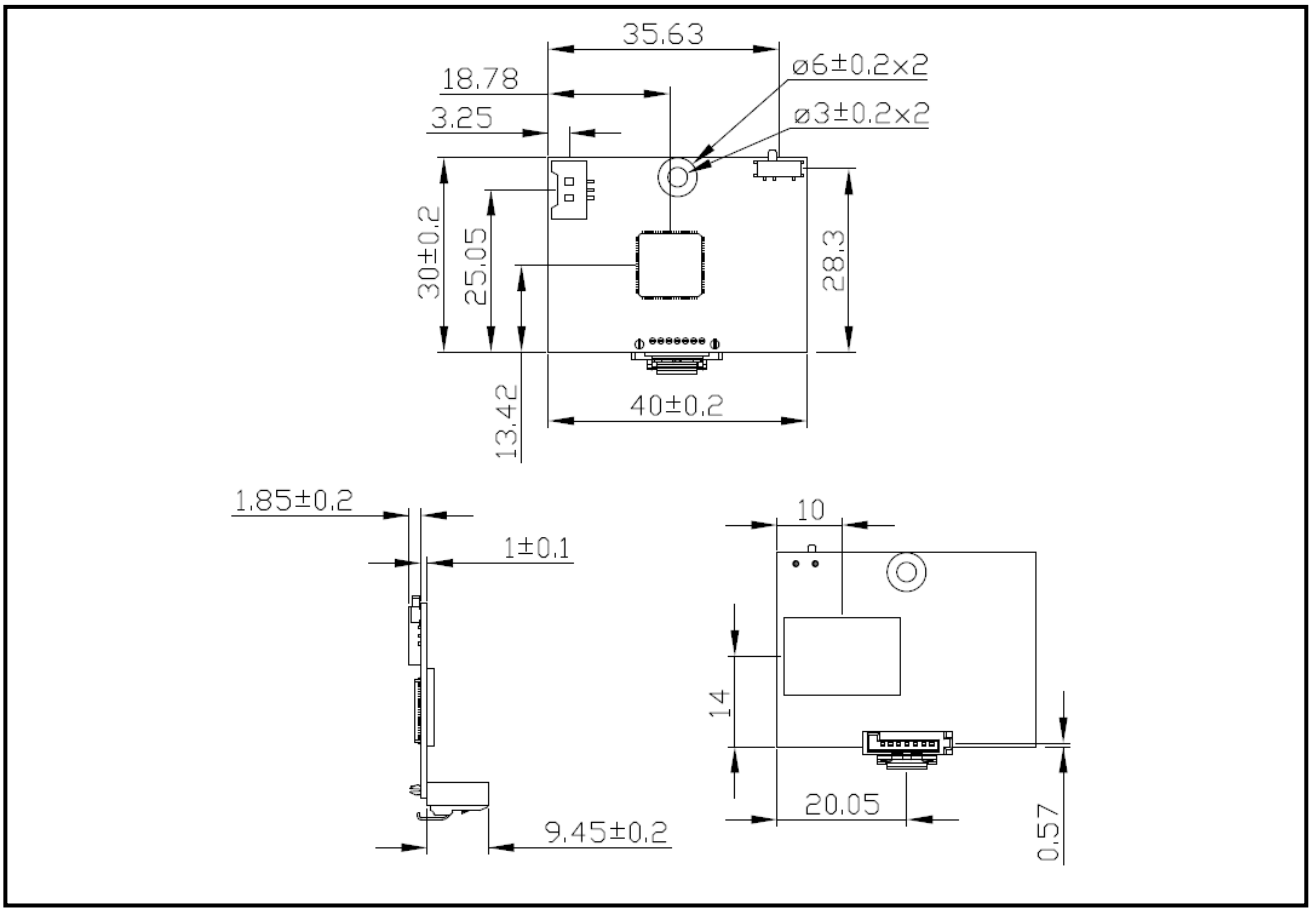
Table 8: Innodisk SATADOM-MH 3SE Pin Assignment

Name	Type	Description
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/Power

CAUTION

SATADOM Pin 7 with power supply version (PN end with F) is provided with different model and PN, which request specific M/B designed with 5V power supply through SATA port(7th Pin), and cannot use external cable for power supply!

2.10 Mechanical Dimensions



2.11 Assembly Weight

An Innodisk SATADOM-MH 3SE within flash ICs, 128GB's weight is 8 grams approximately.

2.12 Seek Time

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

2.13 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.

2.14 NAND Flash Memory

Innodisk SATADOM-MH 3SE uses Single Level Cell (SLC) NAND flashes memory, which is non-volatility, high reliability and high speed memory storage.

3. Theory of Operation

3.1 Overview

Figure 2 shows the operation of Innodisk SATADOM-MH 3SE from the system level, including the major hardware blocks.

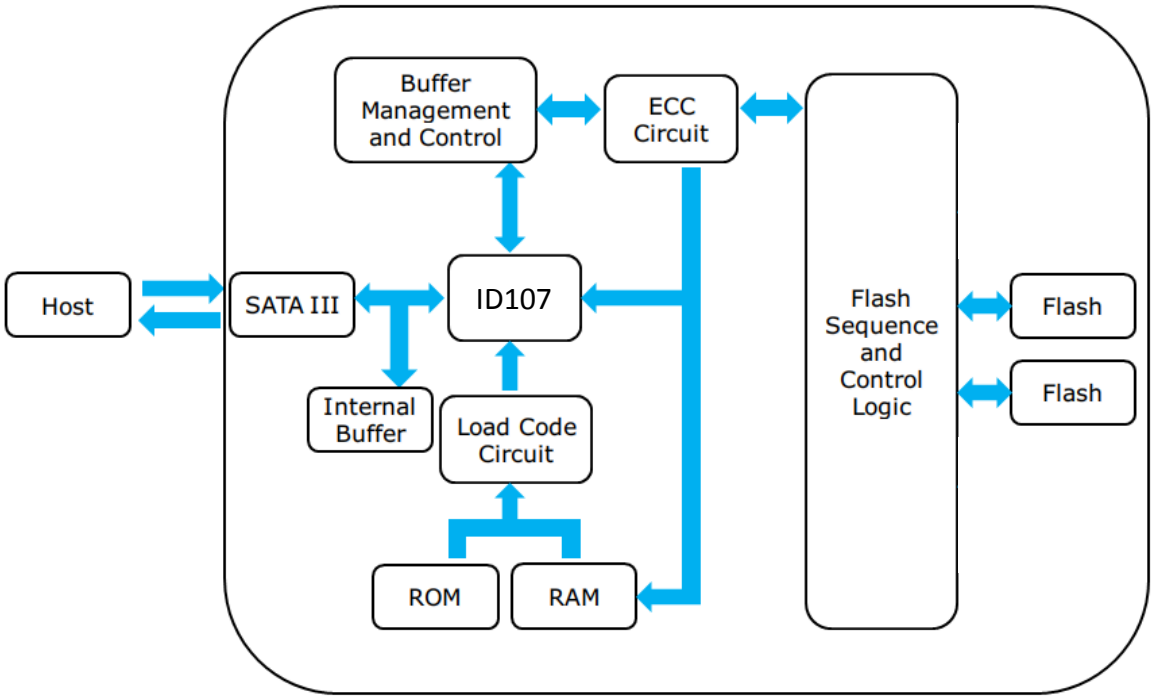


Figure 2: Innodisk SATADOM-MH 3SE Block Diagram

Innodisk SATADOM-MH 3SE 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-MH 3SE is designed with ID 107, 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

Highly sophisticated Error Correction Code algorithms are implemented. The ECC unit consists of the Parity Unit (parity-byte generation) and the Syndrome Unit (syndrome-byte computation). This unit implements an algorithm that can correct 40 bits per 1024 bytes in an ECC block. Code-byte generation during write operations, as well as error detection during read operation, is implemented on the fly without any speed penalties.

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-MH 3SE 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.

3.5 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 Power Cycling

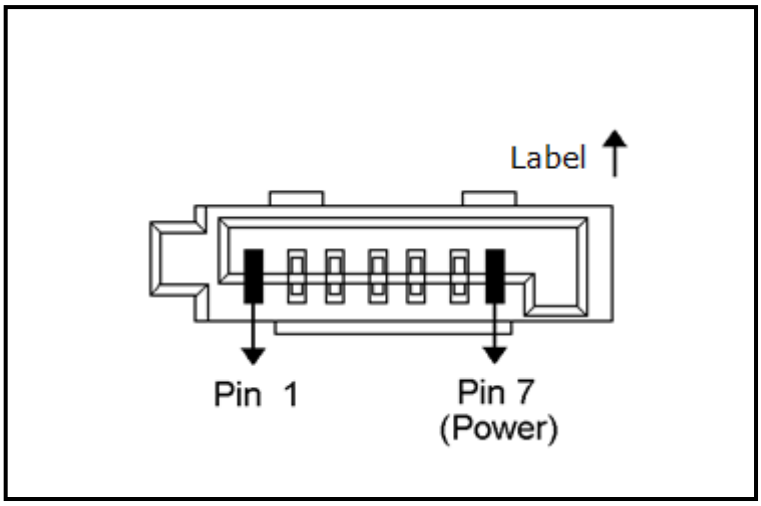
Innodisk's power cycling management is a comprehensive data protection mechanism that functions before and after a sudden power outage to SSD. Low-power detection terminates data writing before an abnormal power-off, while table-remapping after power-on deletes corrupt data and maintains data integrity. Innodisk's power cycling 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.

4. Installation Requirements

4.1 SATADOM-MH 3SE Pin Directions



* All SATADOM Pin 7 with power is separate model, with different PN

Figure 3: Signal Segment and Power Segment

4.2 Electrical Connections for SATADOM-MH 3SE

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 1meter. The SATA interface has a separate connector for the power supply. Please refer to the pin description for further details.

4.3 Write Protection

SATADOM-MH 3SE within the 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-MH 3SE 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.

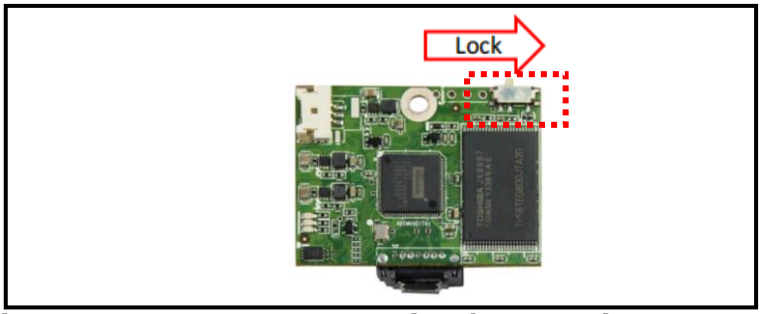


Figure 4: SATADOM-MH 3SE hardware write protect

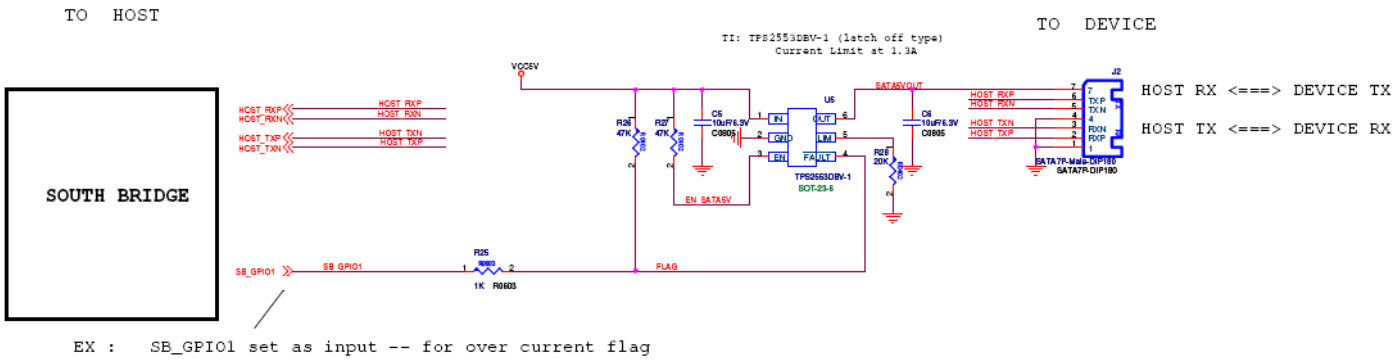
4.4 Device Drive

No additional device drives are required. The Innodisk SATADOM-MH 3SE can be configured as a boot device.

4.5 Pin7 VCC

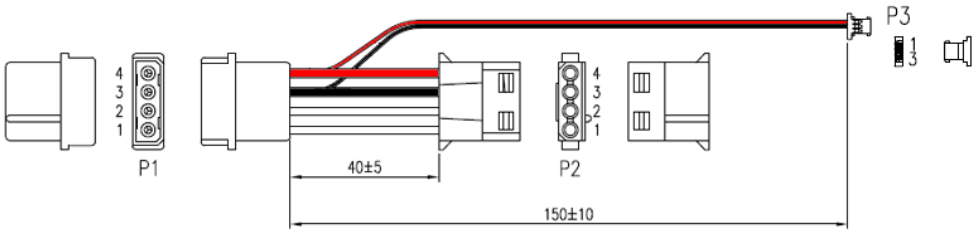
Innodisk SATADOM series products have an optional design to provide power supply through the 7th Pin of SATA connector, and customers DO NOT have to use the power cable for power supply. Such a cable-less design of SATADOM series products with Pin7 VCC brings more convenience to customers' system. The followings are the points customers have to be careful of while designing in SATADOM series products with Pin7 VCC.

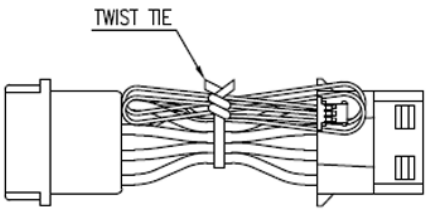
SATADOM series products with Pin7 VCC is designed with a fuse (poly switch 500mA, 6V) on Pin7's circuit. Such a design could avoid any potential damage to customers' system.
To have the advantages of SATADOM series with Pin7 VCC, and to avoid any potential damage to customers' board designed with VCC power supply, Innodisk suggests that customers MUST design their board with a fuse which should be designed before the SATA socket 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.



4.6 Power cable

A power cable is shipped with each SATADOM product, which has standard 4pins 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.





P1	P2	P3	AWG	COLOR
4	---	1	28 AWG/UL 3385	RED
	4	---	18 AWG/UL 3385	RED
3	---	2	28 AWG/UL 3385	BLACK
	3	---	18 AWG/UL 3385	BLACK
2	2	---	18 AWG/UL 3385	BLACK
1	1	---	18 AWG/UL 3385	YELLOW

* PN end with F is SATADOM Pin 7 with power supply version, which doesn't provide power cable.

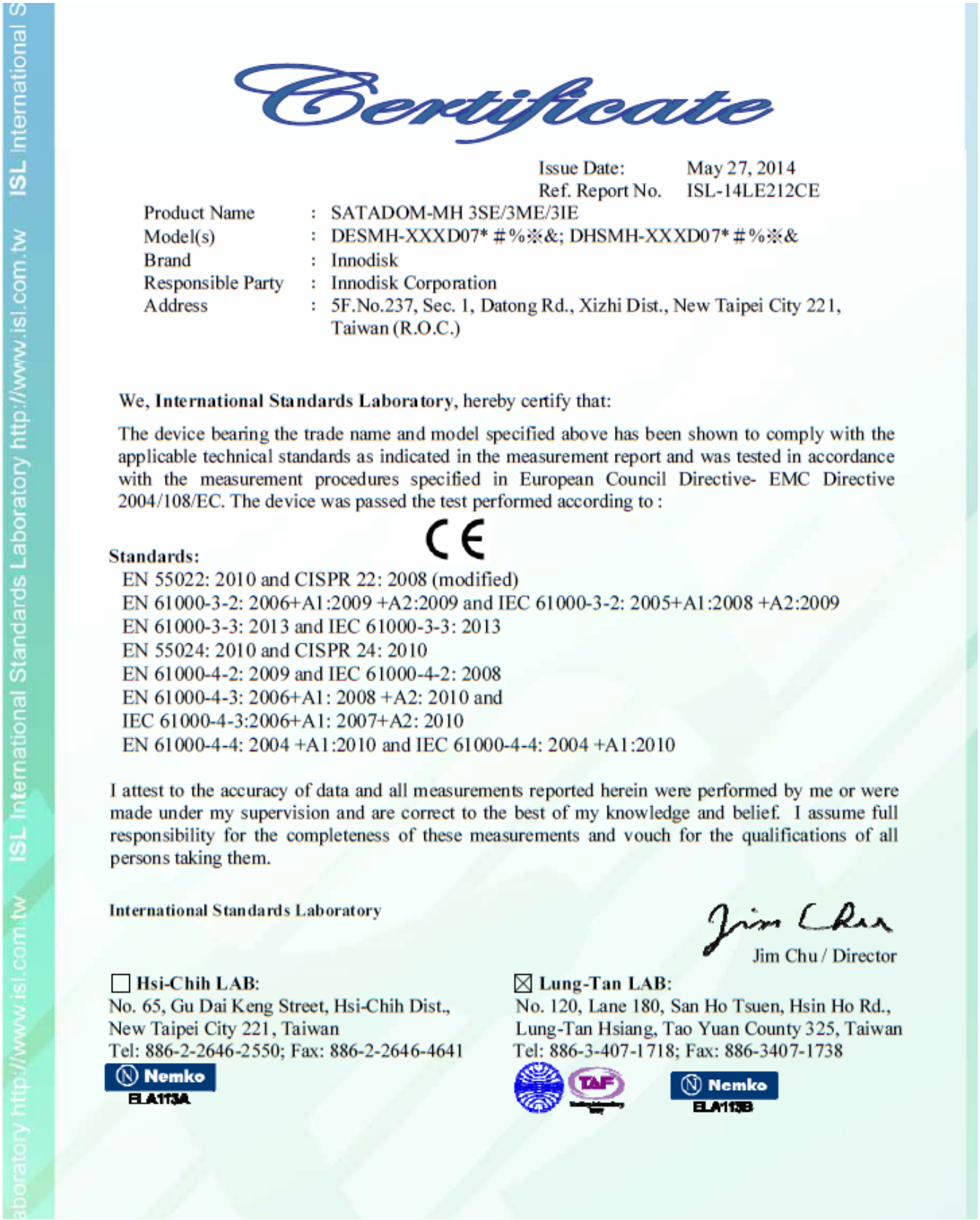
5. Part Number Rule

CODE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	D	**E**	**S**	**M**	**H**	**-**	**6**	**4**	**G**	**D**	**0**	**7**	**A**	**C**	**1**	**D**	**B**	**-**	**X**	**X**	**X**
Description	Disk	mSATA Regular					Capacity			Controller			Flash Mode	Operation Temp.	Internal Control	CH.	Flash Type	-	Customized Code		

Definition	
Code 1st (Disk)	**Code 14th (Operation Temperature)**
D : Disk	C: Standard Grade (0℃~ +70℃)
Code 2nd (Feature set)	W: Industrial Grade (-40℃~ +85℃)
E : Embedded series	**Code 15th (Internal control)**
Code 3rd ~5th (Form factor)	A~Z: BGA PCB version.
SMH: SATADOM-MH	1~9: TSOP PCB version
Code 7th ~9th (Capacity)	**Code 16th (Channel of data transfer)**
04G: 4GB / 08G: 8GB, / 16G: 16GB / 32G: 32GB. / 64G:64GB	D: Dual Channels
Code 10th ~12th (Controller)	
D07: ID107	**Code 17th (Flash Type)**
	B: Toshiba SLC
Code 13th (Flash mode)	**Code 18th (pin7 type)**
A: Asynchronous flash	F: Pin7 version (Optional)
S: Synchronous flash	**Code 19th~21st (Customize code)**

Appendix

CE/FCC/RoHS/PFOS/REACH



Certificate

Issue Date: May 27, 2014
Ref. Report No. ISL-14LE212CE

Product Name	:	SATADOM-MH 3SE/3ME/3IE
Model(s)	:	DESMH-XXXD07* #%※&; DHSMH-XXXD07* #%※&
Brand	:	Innodisk
Responsible Party	:	Innodisk Corporation
Address	:	5F.No.237, Sec. 1, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

We, **International Standards Laboratory**, hereby certify that:

The device bearing the trade name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in European Council Directive- EMC Directive 2004/108/EC. The device was passed the test performed according to :

CE

Standards:

EN 55022: 2010 and CISPR 22: 2008 (modified)
EN 61000-3-2: 2006+A1:2009 +A2:2009 and IEC 61000-3-2: 2005+A1:2008 +A2:2009
EN 61000-3-3: 2013 and IEC 61000-3-3: 2013
EN 55024: 2010 and CISPR 24: 2010
EN 61000-4-2: 2009 and IEC 61000-4-2: 2008
EN 61000-4-3: 2006+A1: 2008 +A2: 2010 and
IEC 61000-4-3:2006+A1: 2007+A2: 2010
EN 61000-4-4: 2004 +A1:2010 and IEC 61000-4-4: 2004 +A1:2010

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

International Standards Laboratory

Jim Chu / Director

☐ **Hsi-Chih LAB:**
No. 65, Gu Dai Keng Street, Hsi-Chih Dist.,
New Taipei City 221, Taiwan
Tel: 886-2-2646-2550; Fax: 886-2-2646-4641

☒ **Lung-Tan LAB:**
No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd.,
Lung-Tan Hsiang, Tao Yuan County 325, Taiwan
Tel: 886-3-407-1718; Fax: 886-3407-1738

Certificate

Issue Date: May 27, 2014
Ref. Report No. ISL-14LE212FB

Product Name	:	SATADOM-MH 3SE/3ME/3IE
Model(s)	:	DESMH-XXXD07* #%※&; DHSMH-XXXD07* #%※&
Brand	:	Innodisk
Applicant	:	Innodisk Corporation
Address	:	5F.No.237, Sec. 1, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

We, **International Standards Laboratory**, hereby certify that:

The device bearing the trade name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified. (refer to Test Report if any modifications were made for compliance).

Standards:

FCC CFR Title 47 Part 15 Subpart B: 2012- Section 15.107 and 15.109
ANSI C63.4-2009
Industry Canada Interference-Causing Equipment Standard ICES-003 Issue 5: 2012

Class B

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

International Standards Laboratory

Jim Chu / Director

☐ **Hsi-Chih LAB:**
No. 65, Gu Dai Keng Street, Hsi-Chih Dist.,
New Taipei City 221, Taiwan
Tel: 886-2-2646-2550; Fax: 886-2-2646-4641

☒ **Lung-Tan LAB:**
No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd.,
Lung-Tan Hsiang, Tao Yuan County 325, Taiwan
Tel: 886-3-407-1718; Fax: 886-3407-1738

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 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) 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

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： 2016 / 08 / 04

宜鼎國際股份有限公司
Innodisk Corporation
Page 1/1
Tel:(02)7703-3000 Fax:(02)7703-3555 Internet: http://www.innodisk.com/

自我宣告書

Manufacturer Product: All Innodisk EM Flash and Dram products

1. 我們特此保證售予貴公司之產品及零組件，皆符合歐盟2006/122/EC之規範要求。
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。

Name of hazardous substance	Limited ppm（mg/kg）
PFOS (Perfluorooctane sulfonates；PFOS) 全氟辛烷磺酸	產品成分配方<50ppm
	半成品或零件<1000ppm
	紡織品或塗層材料<1 μg/m^2
PFOA (Perfluorooctanoic acid；PFOA) 全氟辛酸(銨)	全氟辛酸用在成品中≦1000ppm

立 保 證 書 人 (Guarantor)

Company name 公司名稱：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：2016 / 08 / 29

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/

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