

2.5" SATA SSD

3MR3-P Series

Customer: _____

Customer

Part

Number: _____

Innodisk

Part

Number: _____

Innodisk

Model Name: _____

Date: _____

Innodisk Approver	Customer Approver

Total Solution For
Industrial Flash Storage

Table of Contents

LIST OF FIGURES	6
1. PRODUCT OVERVIEW	7
1.1 INTRODUCTION OF INNODISK 2.5" SATA SSD 3MR3-P.....	7
1.2 PRODUCT VIEW AND MODELS	7
1.3 SATA INTERFACE	8
1.4 2.5-INCH FORM FACTOR	8
2. PRODUCT SPECIFICATIONS.....	9
2.1 CAPACITY AND DEVICE PARAMETERS.....	9
2.2 PERFORMANCE	9
2.3 ELECTRICAL SPECIFICATIONS	9
2.3.1 Power Requirement	9
2.3.2 Power Consumption.....	9
2.4 ENVIRONMENTAL SPECIFICATIONS	10
2.4.1 Temperature Ranges	10
2.4.2 Humidity	10
2.4.3 Shock and Vibration.....	10
2.4.4 Mean Time between Failures (MTBF)	10
2.5 CE AND FCC COMPATIBILITY	11
2.6 RoHS COMPLIANCE	11
2.7 RELIABILITY.....	11
2.8 TRANSFER MODE	11
2.9 PIN ASSIGNMENT	11
2.10 MECHANICAL DIMENSIONS	12
2.12 SEEK TIME	13
2.13 HOT PLUG	13
2.14 NAND FLASH MEMORY	13
3. THEORY OF OPERATION	14
3.1 OVERVIEW	14
3.2 SATA III CONTROLLER	14
3.3 ERROR DETECTION AND CORRECTION.....	14
3.4 WEAR-LEVELING	15
3.5 BAD BLOCKS MANAGEMENT.....	15
3.6 iDATA GUARD.....	15
3.7 GARBAGE COLLECTION/TRIM.....	15
3.8 iCELL TECHNOLOGY.....	15
3.9 QUICK ERASE.....	16
3.10 SECURE ERASE	17

1. AFFSI5020..... 19

2. DoD 5220.22-M..... 20

3. USA Navy NAVSO P-5239-26 21

4. NSA Manual 130-2 22

5. USA-Army 380-19..... 23

6. NISPOMSUP Chap 8, Sect. 8-501 24

7. NSA Manual 9-12 25

8. IRIG1006..... 26

3.11 DESTROY (UNRECOVERABLE DESTROY) 28

3.12 WRITE PROTECT..... 29

4.1 2.5" SATA SSD 3MR3-P PIN DIRECTIONS..... 32

4.2 ELECTRICAL CONNECTIONS FOR 2.5" SATA SSD 3MR3-P 32

4.3 FORM FACTOR..... 33

4.4 DEVICE DRIVE 33

5. PART NUMBER RULE 34

REVISION HISTORY

Revision	Description	Date
Rev 1.0	First Released	Jan., 2016
Rev 1.1	Add Write Protect command code	Mar., 2016
Rev 1.2	Update part number rule	Apr., 2016

List of Tables

TABLE 1: DEVICE PARAMETERS	9
TABLE 2: PERFORMANCE	9
TABLE 3: INNODISK 2.5" SATA SSD 3MR3-P POWER REQUIREMENT	9
TABLE 4: POWER CONSUMPTION	9
TABLE 5: TEMPERATURE RANGE FOR 2.5" SATA SSD 3MR3-P	10
TABLE 6: SHOCK/VIBRATION TESTING FOR 2.5" SATA SSD 3MR3-P	10
TABLE 7: 2.5" SATA SSD 3MR3-P MTBF	10
TABLE 8: INNODISK 2.5" SATA SSD 3MR3-P PIN ASSIGNMENT	11
TABLE 9: EXECUTE QUICK ERASE COMMAND FOR INPUTS INFORMATION	16
TABLE 10: QUICK ERASE COMMAND FOR NORMAL OUTPUT INFORMATION	16
TABLE 11: IDENTIFY INFORMATION	17
TABLE 12: EXECUTE AFFSI 5020 COMMAND FOR INPUTS INFORMATION	19
TABLE 13: AFFSI 5020 COMMAND FOR NORMAL OUTPUT INFORMATION	19
TABLE 14: EXECUTE DoD 5220.22-M COMMAND FOR INPUTS INFORMATION	20
TABLE 15: DoD 5220.22-M COMMAND FOR NORMAL OUTPUT INFORMATION	20
TABLE 16: EXECUTE USA NAVY NAVSO P-5239-26 COMMAND FOR INPUTS INFORMATION	21
TABLE 17: USA NAVY NAVSO P-5239-26 COMMAND FOR NORMAL OUTPUT INFORMATION	21
TABLE 18: EXECUTE NSA MANUAL 130-2 COMMAND FOR INPUTS INFORMATION	22
TABLE 19: NSA MANUAL 130-2 COMMAND FOR NORMAL OUTPUT INFORMATION	22
TABLE 20: EXECUTE USA ARMY 380-19 COMMAND FOR INPUTS INFORMATION	23
TABLE 21: USA ARMY 380-19 COMMAND FOR NORMAL OUTPUT INFORMATION	24
TABLE 22: EXECUTE NISPOMSUP CHAP 8, SECT. 8-501 COMMAND FOR INPUTS INFORMATION	24
TABLE 23: NISPOMSUP CHAP 8, SECT. 8-501 COMMAND FOR NORMAL OUTPUT INFORMATION	25
TABLE 24: EXECUTE NSA MANUAL 9-12 COMMAND FOR INPUTS INFORMATION	25
TABLE 25: NSA MANUAL 9-12 COMMAND FOR NORMAL OUTPUT INFORMATION	26
TABLE 26: EXECUTE IRIG160 COMMAND FOR INPUTS INFORMATION	27
TABLE 27: IRIG160 COMMAND FOR NORMAL OUTPUT INFORMATION	27
TABLE 28: EXECUTE UNRECOVERABLE DESTROY COMMAND FOR INPUTS INFORMATION	28
TABLE 29: UNRECOVERABLE DESTROY COMMAND FOR NORMAL OUTPUT INFORMATION	28
TABLE 30: EXECUTE ENABLE WRITE PROTECT COMMAND FOR INPUTS INFORMATION	29
TABLE 31: EXECUTE ENABLE WRITE PROTECT COMMAND FOR NORMAL OUTPUT INFORMATION	30
TABLE 32: EXECUTE DISABLE WRITE PROTECT COMMAND FOR INPUTS INFORMATION	30
TABLE 33: EXECUTE DISABLE WRITE PROTECT COMMAND FOR NORMAL OUTPUT INFORMATION	30

List of Figures

FIGURE 1: INNODISK 2.5" SATA SSD 3MR3-P7

FIGURE 2: INNODISK 2.5" SATA SSD 3MR3-P BLOCK DIAGRAM 14

FIGURE 3: SIGNAL SEGMENT AND POWER SEGMENT 32

1. Product Overview

1.1 Introduction of Innodisk 2.5" SATA SSD 3MR3-P

Innodisk 2.5" SATA SSD 3MR3-P is a SATA III 6.0Gb/s flash based disk, which delivers excellent performance and reliability. Especially, it comes with several data security functions, including QEraser/ SEraser/ Destroy and also Write Protect. All the security functions can be triggered both by hardware and software approaches. 2.5" SATA SSD 3MR3-P is compliant with MIL-STD-810F/G standards. The SSD is equipped ruggedized hardware design and thus it can perform well in the harsh environment.

Innodisk 2.5" SATA SSD 3MR3-P products provide high capacity flash memory Solid State Drive (SSD) that electrically complies with Serial ATA (SATA) standard. Innodisk 2.5" SATA SSD 3MR3-P delivers sustain read speeds of up to 490MB/s and sustain write speeds of up to 270MB/s. Beside sequential read/ write performance, Innodisk 2.5" SATA SSD 3MR3-P also enhances random data access for small files. Furthermore, Innodisk 2.5" SATA SSD 3MR3-P supports TRIM for windows 7, which can improve performance when deleting files. 2.5" SATA SSD 3MR3-P is developed with Innodisk owned technical knowhow to ensure the data integrity and highest levels of reliability.

1.2 Product View and Models

Innodisk 2.5" SATA SSD 3MR3-P is available in follow capacities within MLC flash ICs.

2.5" SATA SSD 3MR3-P 64GB

2.5" SATA SSD 3MR3-P 256GB

2.5" SATA SSD 3MR3-P 128GB

2.5" SATA SSD 3MR3-P 512GB



Figure 1: Innodisk 2.5" SATA SSD 3MR3-P

1.3 SATA Interface

Innodisk 2.5" SATA SSD 3MR3-P 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 2.5" SATA SSD 3MR3-P 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 7-pin signal segment and a 15-pin power segment.

1.4 2.5-inch Form Factor

The Industry-standard 2.5-inch form factor design with metal material case is easy for installation because 2.5-inch is a popular form factor in industrial field. 2.5-inch is most laptop's hard disk's form factor. Innodisk 2.5" SATA SSD 3MR3-P can easy install in laptop. Innodisk 2.5" SATA SSD 3MR3-P has a compact design 69.85mm (W) x100.10mm (L) x 9.20mm (H).

2. Product Specifications

2.1 Capacity and Device Parameters

2.5" SATA SSD 3MR3-P device parameters are shown in Table 1.

Table 1: Device parameters

Capacity	LBA	Cylinders	Heads	Sectors	User Capacity(MB)
64GB	121138416	16383	16	63	59149
128GB	242255664	16383	16	63	118288
256GB	484490160	16383	16	63	236567
512GB	968959152	16383	16	63	473124

2.2 Performance

Burst Transfer Rate: 6.0Gbps

Table 2: Performance

Capacity	64GB	128GB	256GB	512GB
Sequential Read (max.)	410 MB/s	450 MB/s	480 MB/s	490 MB/s
Sequential Write (max.)	80 MB/s	150 MB/s	220 MB/s	270 MB/s
4KB Random Read (QD32)	25,000	25,000	25,000	25,000
4KB Random Write (QD32)	14,000	24,000	32,000	32,000

Note: Base on CrystalDiskMark 3.03 with file size 1000MB

2.3 Electrical Specifications

2.3.1 Power Requirement

Table 3: Innodisk 2.5" SATA SSD 3MR3-P 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	600 (max.)
Write	900 (max.)
Idle	230 (max.)

* Target: 2.5" SATA SSD 3MR3-P 256GB

2.4 Environmental Specifications

2.4.1 Temperature Ranges

Table 5: Temperature range for 2.5" SATA SSD 3MR3-P

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 2.5" SATA SSD 3MR3-P

Reliability	Test Conditions	Reference Standards
Vibration	7 Hz to 2K Hz, 20G, 3 axes	MIL-STD-810G/F 514.5
Mechanical Shock	Duration: 0.5ms, 1500 G, 3 axes	MIL-STD-810G/F 516.5

2.4.4 Mean Time between Failures (MTBF)

Table 7 summarizes the MTBF prediction results for various 2.5" SATA SSD 3MR3-P 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: 2.5" SATA SSD 3MR3-P MTBF

Product	Condition	MTBF (Hours)
Innodisk 2.5" SATA SSD 3MR3-P	Telcordia SR-332 GB, 25°C	>3,000,000

2.5 CE and FCC Compatibility

2.5" SATA SSD 3MR3-P conforms to CE and FCC requirements.

2.6 RoHS Compliance

2.5" SATA SSD 3MR3-P 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
iData Guard	Support
Thermal Sensor	Support
TBW* (Total Bytes Written)	Unit: TB
64GB	19.2
128GB	38.4
256GB	76.8
512GB	153.6

2.8 Transfer Mode

2.5" SATA SSD 3MR3-P support the following transfer modes,

Serial ATA III 6.0Gbps

Serial ATA II 3.0Gbps

Serial ATA I 1.5Gbps

2.9 Pin Assignment

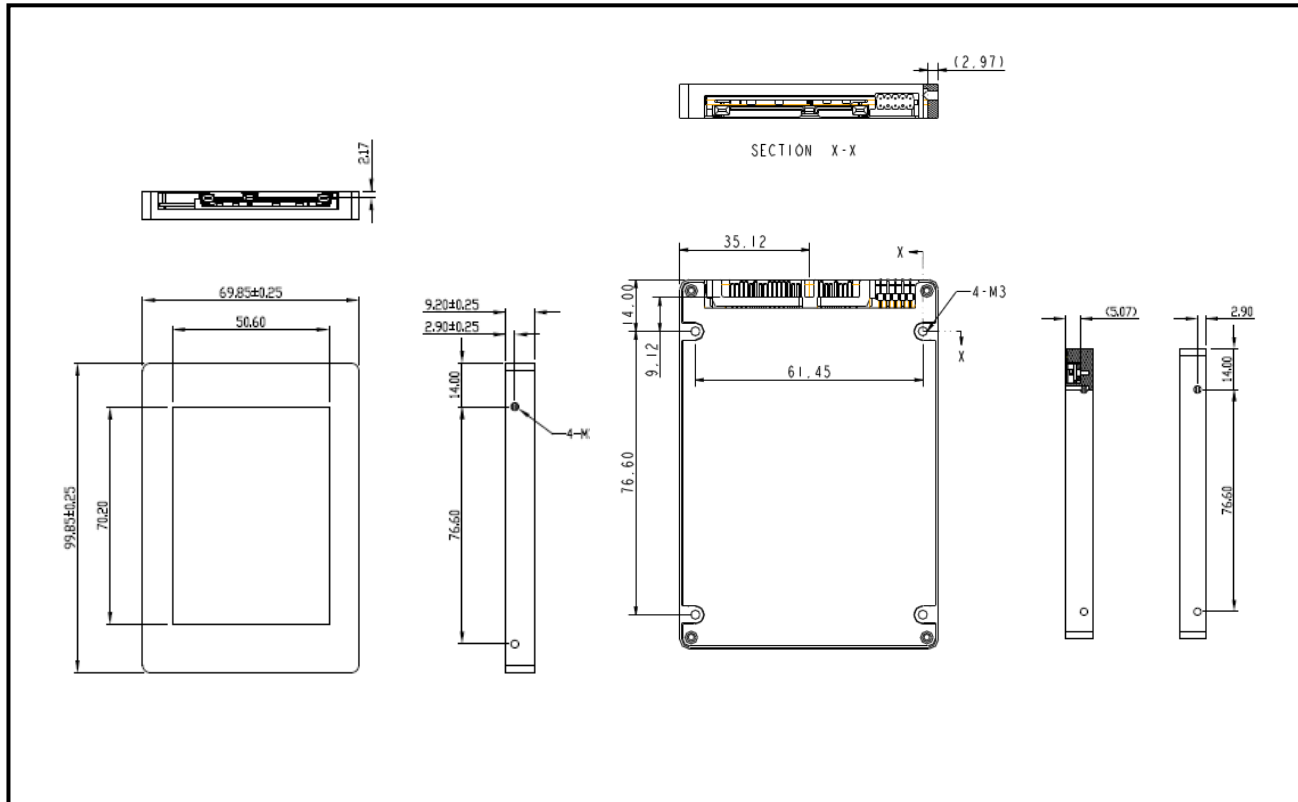
Innodisk 2.5" SATA SSD 3MR3-P uses a standard SATA pin-out. See Table 8 for 2.5" SATA SSD 3MR3-P pin assignment.

Table 8: Innodisk 2.5" SATA SSD 3MR3-P Pin Assignment

Name	Type	Description
S1	GND	NA
S2	A+	Differential Signal Pair A
S3	A-	
S4	GND	NA
S5	B-	Differential Signal Pair B
S6	B+	
S7	GND	NA

Key and Spacing separate signal and power segments

P1	NC	NA
P2	NC	NA
P3	NC	NA
P4	GND	NA
P5	GND	NA
P6	GND	NA
P7	V5	5V Power, Pre-Charge
P8	V5	5V Power
P9	V5	5V Power
P10	GND	NA
P11	DAS/DSS	Device Activity Signal / Disable Staggered
P12	GND	NA
P13	NC	NA
P14	NC	NA
P15	NC	NA

2.10 Mechanical Dimensions

2.11 Assembly Weight

An Innodisk 2.5" SATA SSD 3MR3-P within MLC flash ICs, 32GB's weight is 100 grams approx. The total weight of SSD will be less than 110 grams.

2.12 Seek Time

Innodisk 2.5" SATA SSD 3MR3-P 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 2.5" SATA SSD 3MR3-P uses Multi Level Cell (MLC) NAND flash memory, which is non-volatility, high reliability and high speed memory storage. There are only four statuses 00, 01, 10 or 11 of two cells. Read or Write data to flash memory for SSD is control by microprocessor.

3. Theory of Operation

3.1 Overview

Figure 2 shows the operation of Innodisk 2.5" SATA SSD 3MR3-P from the system level, including the major hardware blocks.

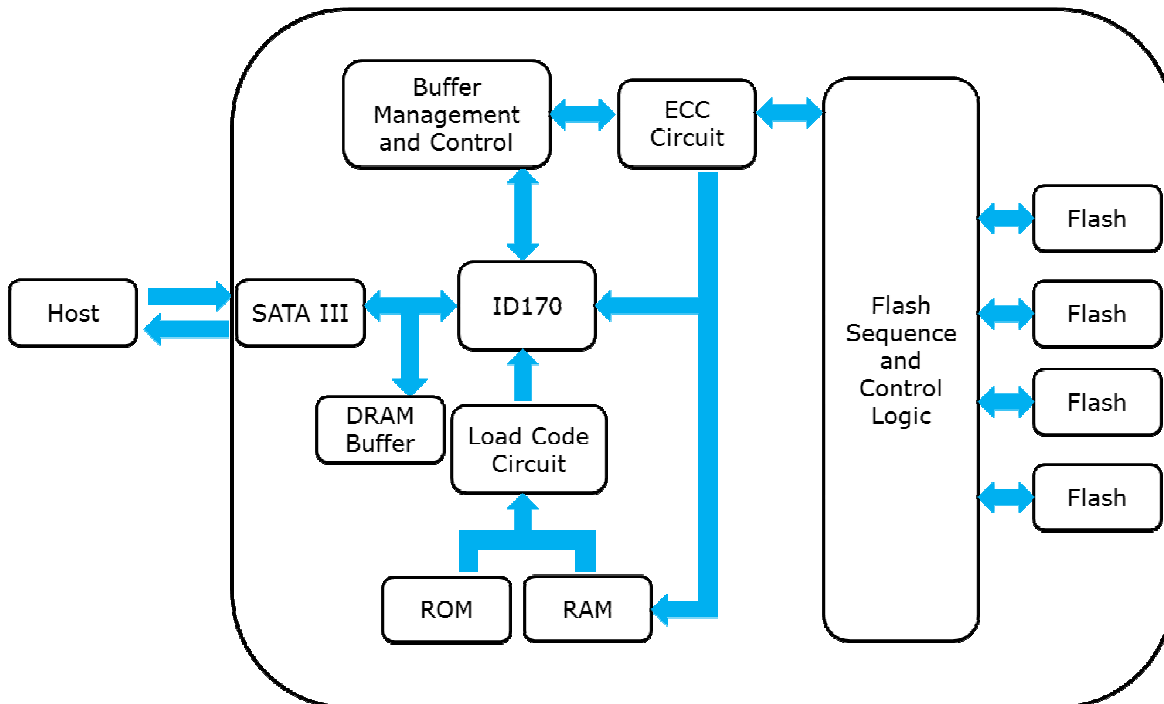


Figure 2: Innodisk 2.5" SATA SSD 3MR3-P Block Diagram

Innodisk 2.5" SATA SSD 3MR3-P 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 2.5" SATA SSD 3MR3-P is designed with ID 170, a SATA III 6.0Gbps (Gen. 3) controller, which supports external DDR3 DRAM. 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 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 72 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 2.5" SATA SSD 3MR3-P 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 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.

3.7 Garbage Collection/TRIM

Garbage collection and TRIM technology 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.

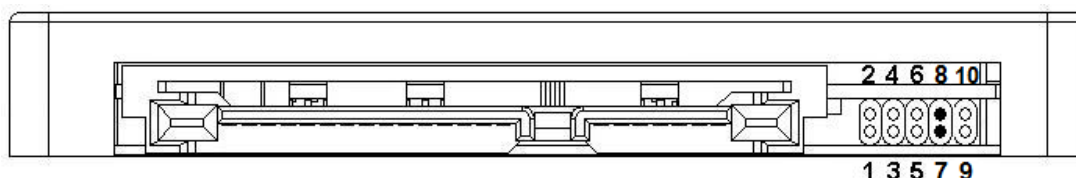
3.8 iCell Technology

iCell circuit is designed with several capacitors to be able to provide power after host power off. The SSD controller can write all DRAM buffer data to flash, so that is why 2.5" SATA SSD 3MR3-P

can ensure all data can be written to disk without any data loss.

3.9 Quick Erase

Quick Erase function is designed for emergency data erase in few seconds by providing ATA command or shorting Quick Erase Pins (Pin 7 and Pin 8) with an external jumper to erase all of data block.



3.9.1 Quick Erase Command

-Protocol: Non Data Command

-Inputs

Table 9: Execute Quick Erase command for inputs information

Register	7	6	5	4	3	2	1	0
Features	21h							
Sector Count	41h							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	1	1	1	0	Na			
Command	82h							

-Normal Outputs

Table 10: Quick Erase command for normal output information

Register	7	6	5	4	3	2	1	0
Error	Na							
Sector Count	Na							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	obs	Na	obs	DEV	Na	Na	Na	Na
Status	BSY	DRDY	DF	Na	DRQ	Na	Na	ERR

Device register-

DEV shall specify the selected device.

Status register

BSY will be cleared to zero indicating command completion

DRDY will be set to one.

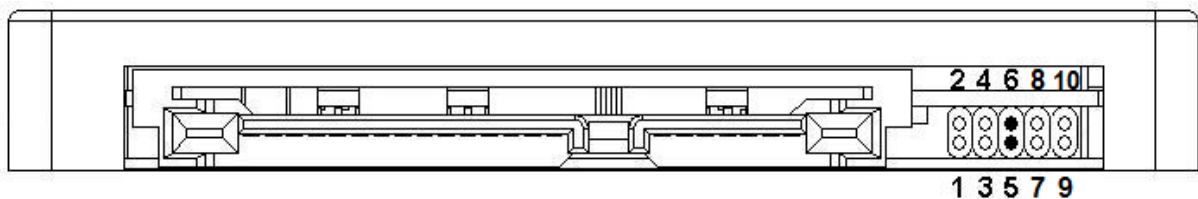
DF (Device Fault) will be cleared to zero.

DRQ will be cleared to zero

ERR will be cleared to zero.

3.10 Secure Erase

Secure Erase function is designed for emergency data erase to comply with military standard. Erase functions can be triggered by shorting Secure Erase Pins (Pin 5 and Pin 6) or by sending ATA Command. All Data Block of flash chip will be erased by sending flash erase command. SE Pin can be set as one military Secure Erase standards.



Innodisk provides the following Security Erase for options:

- (1) AFFSI 5020
- (2) DoD 5220.22-M
- (3) USA Navy NAVSO P-5239-26
- (4) NSA Manual 130-2
- (5) USA-Army 380-19
- (6) NISPOMSUP Chap 8, Sect. 8-501
- (7) NSA Manual 9-12
- (8) IRIG 106

3.10.1 Secure Erase Command

Identify Information

Word 159 of Identify Table shows the SE pin's function. Identify Table can be read by sending ECh ATA command.

Table 11: Identify Information

154	Secure Function Support 7-15 Reserved	0
-----	---	---

	6	1= Secure Erase ATA Vendor Command Supported	X
	5	Reserved	0
	4	1=Quick Erase ATA Vendor Command Supported	X
	3	1=Destroy ATA Vendor Command Supported	X
	1	1=Jumper Secure Erase Supported	X
	1	1=Jumper Write Protect Supported	X
	0	1=Jumper Quick Erase Supported	X
155	Secure Function Status(Enable/Disable)		
	2-15	Reserved	
	1	1= Write Protect Enabled	X
	0	Reserved	0
156-158	Vendor Specific		
159	8~15 Function of Jumper "QE" 0x20: Destroy 0x21 or Others: Quick Erase 0~7 Secure Erase Function of Jumper "SE" 0x22: AFFSI 5020 0x23: DoD 5220.22-M 0x24: USA Navy NAVSO P-5239-26 0x25: NSA Manual 130-2 0x26: USA-Army 380-19 0x27: NISPOMSUP Chap 8, Sect. 8-501 0x28: NSA Manual 9-12 0x29: IRIG106		XXXXh

1. AFFSI5020

This function is compliant with AFFSI 5020 specification.

Steps:

1. The whole disk is erased using Flash Erase Command.
2. The whole disk is filled with random data.

-Protocol: Non Data Command**-Inputs****Table 12: Execute AFFSI 5020 command for inputs information**

Register	7	6	5	4	3	2	1	0
Features	22h							
Sector Count	41h							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	1	1	1	0	Na			
Command	82h							

-Normal Outputs**Table 13: AFFSI 5020 command for normal output information**

Register	7	6	5	4	3	2	1	0
Error	Na							
Sector Count	Na							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	obs	Na	obs	DEV	Na	Na	Na	Na
Status	BSY	DRDY	DF	Na	DRQ	Na	Na	ERR

Device register-

DEV shall specify the selected device.

Status register

BSY will be cleared to zero indicating command completion

DRDY will be set to one.

DF (Device Fault) will be cleared to zero.

DRQ will be cleared to zero

ERR will be cleared to zero.

2. DoD 5220.22-M

This function is compliant with DoD 5220.22-M specification.

Steps:

1. The whole disk is filled with fixed character pattern 0x55.
2. The whole disk is erased using Flash Erase Command.

-Protocol: Non Data Command

-Inputs

Table 14: Execute DoD 5220.22-M command for inputs information

Register	7	6	5	4	3	2	1	0
Features	23h							
Sector Count	41h							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	1	1	1	0	Na			
Command	82h							

-Normal Outputs

Table 15: DoD 5220.22-M command for normal output information

Register	7	6	5	4	3	2	1	0
Error	Na							
Sector Count	Na							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	obs	Na	obs	DEV	Na	Na	Na	Na
Status	BSY	DRDY	DF	Na	DRQ	Na	Na	ERR

Device register-

DEV shall specify the selected device.

Status register

BSY will be cleared to zero indicating command completion

DRDY will be set to one.

DF (Device Fault) will be cleared to zero.

DRQ will be cleared to zero

ERR will be cleared to zero.

3. USA Navy NAVSO P-5239-26

This function is compliant with USA Navy NAVSO P-5239-26 specification.

Steps:

1. The whole disk is erased using Flash Erase Command.
2. The whole disk is filled with random data.
3. The whole disk is erased using Flash Erase Command.

-Protocol: Non Data Command

-Inputs

Table 16: Execute USA Navy NAVSO P-5239-26 command for inputs information

Register	7	6	5	4	3	2	1	0
Features	24h							
Sector Count	41h							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	1	1	1	0	Na			
Command	82h							

-Normal Outputs

Table 17: USA Navy NAVSO P-5239-26 command for normal output information

Register	7	6	5	4	3	2	1	0
Error	Na							
Sector Count	Na							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	obs	Na	obs	DEV	Na	Na	Na	Na
Status	BSY	DRDY	DF	Na	DRQ	Na	Na	ERR

Device register-

DEV shall specify the selected device.

Status register

BSY will be cleared to zero indicating command completion

DRDY will be set to one.

DF (Device Fault) will be cleared to zero.

DRQ will be cleared to zero

ERR will be cleared to zero.

4. NSA Manual 130-2

This function is compliant with NSA Manual 130-2 specification.

Steps:

1. The whole disk is erased using Flash Erase Command.
2. The whole disk is filled with random data.
3. The whole disk is filled with random data again.
4. The whole disk is erased using Flash Erase Command. The whole disk is filled with fixed character pattern 0x55.

-Protocol: Non Data Command

-Inputs

Table 18: Execute NSA Manual 130-2 command for inputs information

Register	7	6	5	4	3	2	1	0
Features	25h							
Sector Count	41h							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	1	1	1	0	Na			
Command	82h							

-Normal Outputs

Table 19: NSA Manual 130-2 command for normal output information

Register	7	6	5	4	3	2	1	0
Error	Na							
Sector Count	Na							

LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	obs	Na	obs	DEV	Na	Na	Na	Na
Status	BSY	DRDY	DF	Na	DRQ	Na	Na	ERR

Device register-

DEV shall specify the selected device.

Status register

BSY will be cleared to zero indicating command completion

DRDY will be set to one.

DF (Device Fault) will be cleared to zero.

DRQ will be cleared to zero

ERR will be cleared to zero.

5. USA-Army 380-19

This function is compliant with USA-Army 380-19 specification.

Step:

1. The whole disk is erased using Flash Erase Command.
2. The whole disk is filled with random data.
3. The whole disk is filled with fixed character pattern 0x55.
4. The whole disk is filled with fixed character pattern 0xAA.

-Protocol: Non Data Command

-Inputs

Table 20: Execute USA Army 380-19 command for inputs information

Register	7	6	5	4	3	2	1	0
Features	26h							
Sector Count	41h							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	1	1	1	0	Na			
Command	82h							

-Normal Outputs**Table 21: USA Army 380-19 command for normal output information**

Register	7	6	5	4	3	2	1	0
Error	Na							
Sector Count	Na							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	obs	Na	obs	DEV	Na	Na	Na	Na
Status	BSY	DRDY	DF	Na	DRQ	Na	Na	ERR

Device register-

DEV shall specify the selected device.

Status register

BSY will be cleared to zero indicating command completion

DRDY will be set to one.

DF (Device Fault) will be cleared to zero.

DRQ will be cleared to zero

ERR will be cleared to zero.

6. NISPOMSUP Chap 8, Sect. 8-501

This function is compliant with NISPOMSUP Chap 8, Sect. 8-501 specification.

Steps:

1. The whole disk is filled with fixed character pattern 0x55.
2. The whole disk is filled with fixed character pattern 0xAA.
3. The whole disk is filled with random data.

-Protocol: Non Data Command**-Inputs****Table 22: Execute NISPOMSUP Chap 8, Sect. 8-501 command for inputs information**

Register	7	6	5	4	3	2	1	0
Features	27h							
Sector Count	41h							

LBA Low	Na				
LBA Mid	Na				
LBA High	Na				
Device	1	1	1	0	Na
Command	82h				

-Normal Outputs

Table 23: NISPOMSUP Chap 8, Sect. 8-501 command for normal output information

Register	7	6	5	4	3	2	1	0
Error	Na							
Sector Count	Na							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	obs	Na	obs	DEV	Na	Na	Na	Na
Status	BSY	DRDY	DF	Na	DRQ	Na	Na	ERR

Device register-

DEV shall specify the selected device.

Status register

BSY will be cleared to zero indicating command completion

DRDY will be set to one.

DF (Device Fault) will be cleared to zero.

DRQ will be cleared to zero

ERR will be cleared to zero.

7. NSA Manual 9-12

This function is compliant with NSA Manual 9-12 specification.

Step:

1. The whole disk is erased using Flash Erase Command.
2. The whole disk is filled with unclassified pattern.
3. Verify the overwrite procedure by randomly rereading the overwritten information.

-Protocol: Non Data Command

-Inputs

Table 24: Execute NSA Manual 9-12 command for inputs information

Register	7	6	5	4	3	2	1	0
Features	28h							
Sector Count	41h							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	1	1	1	0	Na			
Command	82h							

-Normal Outputs

Table 25: NSA Manual 9-12 command for normal output information

Register	7	6	5	4	3	2	1	0
Error	Na							
Sector Count	Na							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	obs	Na	obs	DEV	Na	Na	Na	Na
Status	BSY	DRDY	DF	Na	DRQ	Na	Na	ERR

Device register-

DEV shall specify the selected device.

Status register

BSY will be cleared to zero indicating command completion

DRDY will be set to one.

DF (Device Fault) will be cleared to zero.

DRQ will be cleared to zero

ERR will be cleared to zero.

8. IRIG1006

This function is compliant with IRIG106 specification.

Step:

1. The whole disk is erased using Flash Erase Command.
2. The whole disk is filled with pattern 0x55, and read back to verify.

3. The whole disk is erased using Flash Erase Command.
4. The whole disk is filled with pattern 0xAA, and read back to verify.
5. The whole disk is erased using Flash Erase Command.
6. Write 0x00 to all bad blocks. If there is any bit is still 1, the page is re-written 0 again. This procedure this repeated up to 16 times.
7. Erase all bad blocks and checked to determine if any zero are found. If any zeros are found, erase this block again. This procedure this repeated up to 16 times.
8. Write "Secure Erase" string to all blocks.

-Protocol: Non Data Command

-Inputs

Table 26: Execute IRIG160 command for inputs information

Register	7	6	5	4	3	2	1	0
Features	29h							
Sector Count	41h							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	1	1	1	0	Na			
Command	82h							

-Normal Outputs

Table 27: IRIG160 command for normal output information

Register	7	6	5	4	3	2	1	0
Error	Na							
Sector Count	Na							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	obs	Na	obs	DEV	Na	Na	Na	Na
Status	BSY	DRDY	DF	Na	DRQ	Na	Na	ERR

Device register-

DEV shall specify the selected device.

Status register

BSY will be cleared to zero indicating command completion

DRDY will be set to one.

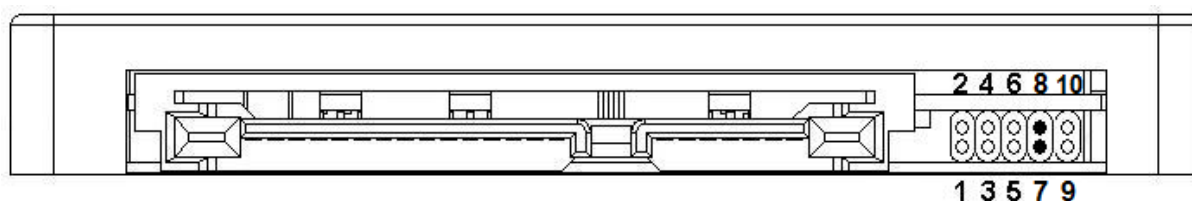
DF (Device Fault) will be cleared to zero.

DRQ will be cleared to zero

ERR will be cleared to zero.

3.11 Destroy (Unrecoverable Destroy)

Innodisk Unrecoverable Destroy function implements an ultimate data erase of the SSD. Once Unrecoverable Destroy is triggered, beside all the user data and SSD information, also SSD firmware will be erased and which is unusable. InnoRobust SATA SSD pin 7 and 8 are set for QEraser. Destroy is optional and available for customization.



3.11.1 Unrecoverable Destroy Command

-Protocol: Non Data Command

-Inputs

Table 28: Execute Unrecoverable Destroy command for inputs information

Register	7	6	5	4	3	2	1	0
Features	20h							
Sector Count	41h							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	1	1	1	0	Na			
Command	82h							

-Normal Outputs

Table 29: Unrecoverable Destroy command for normal output information

Register	7	6	5	4	3	2	1	0
Error	Na							
Sector Count	Na							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							

Device	obs	Na	obs	DEV	Na	Na	Na	Na
Status	BSY	DRDY	DF	Na	DRQ	Na	Na	ERR

Device register-

DEV shall specify the selected device.

Status register

BSY will be cleared to zero indicating command completion

DRDY will be set to one.

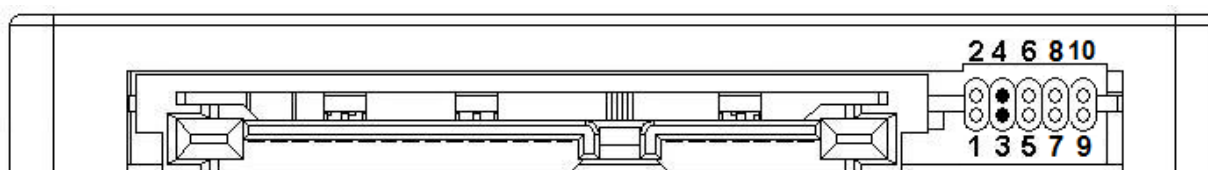
DF (Device Fault) will be cleared to zero.

DRQ will be cleared to zero

ERR will be cleared to zero.

3.12 Write Protect

When Write Protect pins (pin3 and pin4) are shorted, Write Protect function would be enabled, and ATA write command would be aborted, which can prevent the disk from data modification or data deletion. Write-protected data in disk is read-only, that is, users could not write to it, edit it, append data to it, or delete it.



3.12.1 Enable Write Protect Command

This command enable SSD into write protect mode, which is read-only. The SSD under write protect will overpass any write command.

-Protocol: Non Data Command

-Inputs

Table 30: Execute Enable Write Protect command for inputs information

Register	7	6	5	4	3	2	1	0
Features	01h							
Sector Count	41h							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	1	1	1	0	Na			

Command	84h
---------	-----

-Normal Outputs

Table 31: Execute Enable Write Protect command for normal output information

Register	7	6	5	4	3	2	1	0
Error	Na							
Sector Count	Na							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	obs	Na	obs	DEV	Na	Na	Na	Na
Status	BSY	DRDY	DF	Na	DRQ	Na	Na	ERR

Device register-

DEV shall specify the selected device.

Status register

BSY will be cleared to zero indicating command completion

DRDY will be set to one.

DF (Device Fault) will be cleared to zero.

DRQ will be cleared to zero

ERR will be cleared to zero.

3.12.2 Disable Write Protect Command

This command disable SSD's write protect feature.

-Protocol: Non Data Command

-Inputs

Table 32: Execute Disable Write Protect command for inputs information

Register	7	6	5	4	3	2	1	0
Features	00h							
Sector Count	41h							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	1	1	1	0	Na			
Command	84h							

-Normal Outputs

Table 33: Execute Disable Write Protect command for normal output information

Register	7	6	5	4	3	2	1	0
Error	Na							
Sector Count	Na							
LBA Low	Na							
LBA Mid	Na							
LBA High	Na							
Device	obs	Na	obs	DEV	Na	Na	Na	Na
Status	BSY	DRDY	DF	Na	DRQ	Na	Na	ERR

Device register-

DEV shall specify the selected device.

Status register

BSY will be cleared to zero indicating command completion

DRDY will be set to one.

DF (Device Fault) will be cleared to zero.

DRQ will be cleared to zero

ERR will be cleared to zero.

4. Installation Requirements

4.1 2.5" SATA SSD 3MR3-P Pin Directions

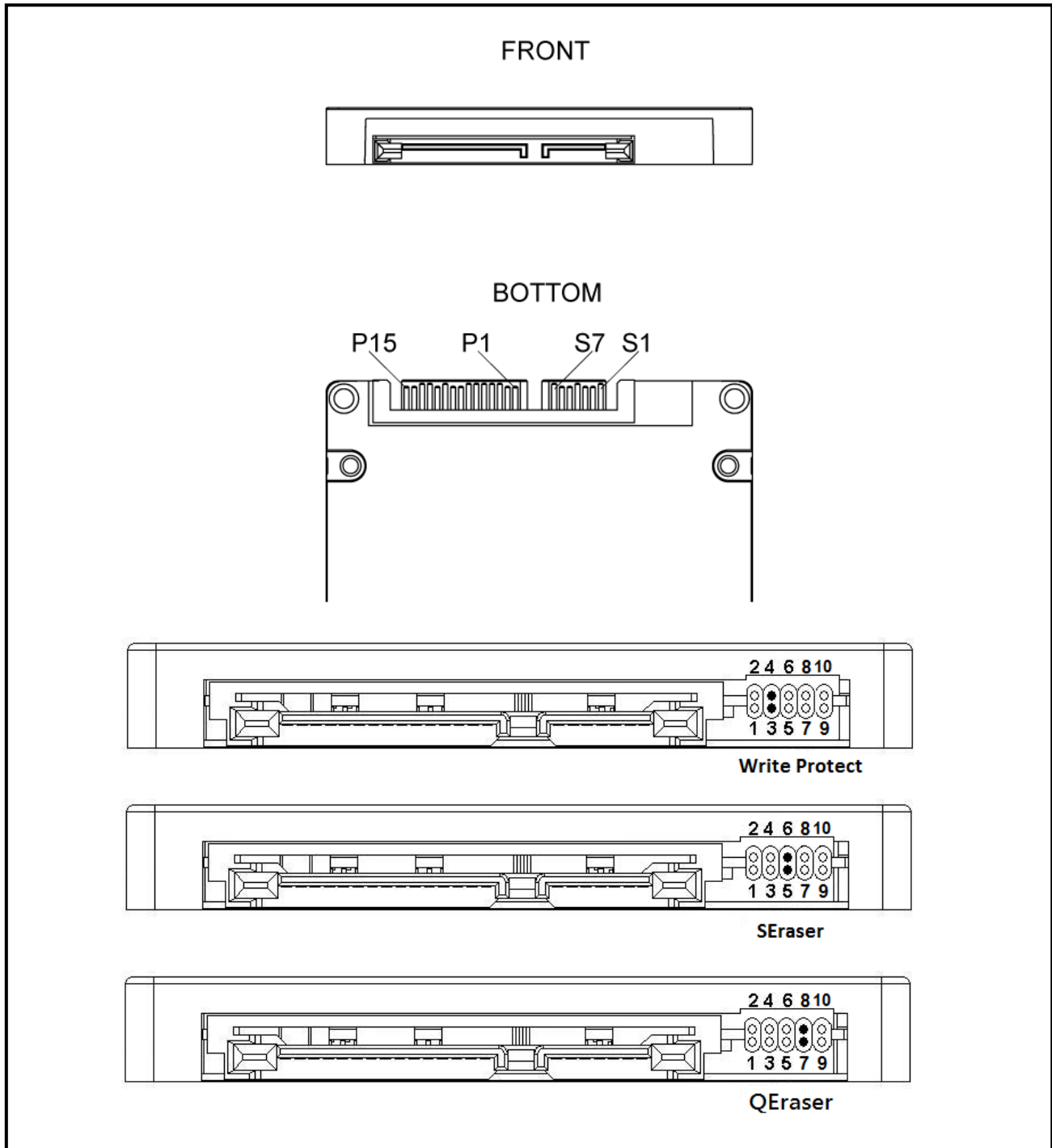


Figure 3: Signal Segment and Power Segment

4.2 Electrical Connections for 2.5" SATA SSD 3MR3-P

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 Form Factor

Please prepare following things:

- Screw driver.
- Four M3 screws.
- SATA single cable (7-pin, Maximum length 1 meter).
- SATA power cable (15-pin).

Please turn off your computer, and open your computer's case. Find one of available 2.5-inch slot, and plug the SSD in. To use the screws fix the SSD. Plug in the SATA single cable, and power cable. Please boot the installation Operation System from CD-ROM, and install Operation System into SSD.

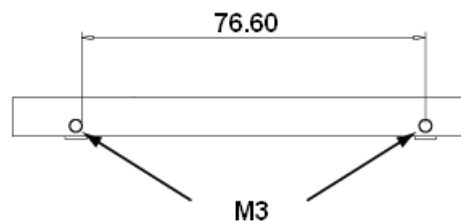


Figure 4: 2.5" SATA SSD 3MR3-P Mechanical Screw Hole

4.4 Device Drive

No additional device drives are required. Innodisk 2.5" SATA SSD 3MR3-P can be configured as a boot device.

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
	D	R	S	2	5	-	6	4	G	D	7	0	B	C	A	Q	C	-	X	X
Definition																				
Code 1 st (Disk)										Code 13 th (Flash Mode)										
D : Disk										B: Synchronous Flash for Toshiba 15nm										
Code 2 nd (Feature Set)										Code 14 th (Operation Temperature)										
R: InnoRobust										C: Standard Grade (0°C ~ +70°C)										
Code 3 rd ~5 th (Form Factor)										W: Industrial Grade (-40°C ~ +85°C)										
S25: 2.5" SATA SSD										K: Standard Grade with Coating (0°C ~ +70°C)										
										T: Industrial Grade with Coating (-40°C ~ +85°C)										
										Code 15 th (Internal Control)										
Code 7 th ~9 th (Capacity)										A: compliant to 9mm height housing										
64G: 64GB																				
A28: 128GB										Code 16 th (Channel of Data Transfer)										
B56: 256GB										Q: Quad Channels										
C12: 512GB										Code 17 th (Flash Type)										
										C: Toshiba MLC										
Code 10 th ~12 th (Controller)										Code 19 th ~20 th (Customized Code)										
D70: ID170																				

Appendix

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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)
Cd	< 100 ppm
Pb	< 1000 ppm
Hg	< 1000 ppm
Chromium VI (Cr+6)	< 1000 ppm
Polybromodiphenyl ether (PBDE)	< 1000 ppm
Polybrominated Biphenyls (PBB)	< 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： Richard Lee 李鐘亮

Company Representative Title 公司代表人職稱： CEO 執行長

Date 日期： 2014 / 07 / 29



(Company Stamp/公司大小章)

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/>

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 ; REACH)之規定
(<http://www.echa.europa.eu/de/candidate-list-table> last updated: 16/05/2014)。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 REACH Regulation
(<http://www.echa.europa.eu/de/candidate-list-table> last updated: 16/06/2014).
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： Richard Lee 李鐘亮

Company Representative Title 公司代表人職稱： CEO 執行長

Date 日期： 2014 / 07 / 29



Certificate

Issue Date: January 16, 2015
Ref. Report No. ISL-15LE018CE

Product Name : 2.5" SATA SSD
Model(s) : 2.5" SATA SSD 35*#-&
(S:Flash type: (S:SLC,I:iSLC,M:MLC) *: Product line: (E:Embedded, G: EverGreen, R: InnoRobust) #:controller: (empty:106/107/167/170, 2: 201/ 202, 3:108/109) &: Product feature: (P: with DRAM, empty: without DRAM))
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 :



Standards:

EN 55022: 2010+AC2011 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 61000-4-4:2012 and IEC 61000-4-4:2012

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
Jim Chu / Director

☐ Hsi-Chih LAB:

No. 65, Gu Dai Keng Street, Hsi-Chih Dist.,
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Lung-Tan Hsiang, Tao Yuan County 325, Taiwan
Tel: 886-3-407-1718; Fax: 886-3407-1738



Certificate

Issue Date: January 16, 2015
Ref. Report No.: ISL-15LE018FB

Product Name : 2.5" SATA SSD
Model(s) : 2.5" SATA SSD 3\$*#-& (\$:Flash type: (S:SLC,LiSLC,M:MLC) *: Product line: (E:Embedded, G: EverGreen, R: InnoRobust) #:controller: (empty:106/107/167/170, 2: 201/ 202, 3:108/109) &: Product feature: (P: with DRAM, empty: without DRAM))
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
Jim Chu / Director

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