2.5" SATA SSD

3TG6-P Series

AES function

Customer:

Customer Part Number:

Innodisk Part Number:

Innodisk Model Name:

Date:

Innodisk Approver	Customer Approver

Features:

- SATA III
- Kioxia 3D TLC NAND
- 2.5" SATA SSD
- Standard & Wide-temperature
- AES-256 encryption
- iPowerguard
- iDataguard
- Dynamic Thermal Management

Performance:

- Sequential Read up to 560 MB/s
- Sequential Write up to 520 MB/s

Power Requirements:

Input Voltage:	5V±5%
Max Operating Wattage:	5.9W
Idle Wattage:	3.5W

Reliability:

Capacity	TBW	DWPD
128GB	289	2.1
256GB	578	2.1
512GB	1154	2.1
1TB	2308	2.1
2TB	4615	2.1
4TB	9231	2.1

Data Retention	10 Years
Warranty	3 Years

For warranty details, please refer to:

https://www.innodisk.com/en/support_and_service/warranty

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REVISION HISTORY

Revision	Description	Date
Rev. 1.0	First Released	Jul., 2020
Rev. 2.0	Add 96L information	Aug., 2021
Rev. 2.1	Update LBA	Nov., 2021
Rev. 2.2	Add 112L information	Jan., 2022
Rev. 2.3	Update Write Protect Option	Mar., 2022
Rev. 2.4	Add notes for TCG OPAL	May., 2022
Rev. 2.5	Add an image of Quick Erase	May., 2022
Rev. 2.6	Revised Power Consumption	Jun., 2022
Rev. 2.7	Update 128GB LBA	Oct., 2022
Rev. 2.8	Update Assembly Torque Information	Mar., 2023
Rev. 2.9	Update Part Number Rule	May, 2023
Rev. 3.0	Update TCG Opal Information	Jul., 2024
Rev. 3.1	Update TCG Opal Information	Jun., 2025

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1. Product Overview

1.1 Introduction of Innodisk 2.5″ SATA SSD 3TG6-P with AES function

Innodisk 2.5″ SATA SSD 3TG6-P products provide high capacity flash memory Solid State Drive (SSD) that electrically complies with Serial ATA (SATA) standard. It supports SATA III standard (6.0GHz) with high performance. Innodisk 2.5″ SATA SSD 3TG6-P is designed with AES engine, which is built-in the controller. When controller receives the data package from host, AES engine encrypts the data package and save the encrypted data into NAND flash. Thus, unauthorized personal has no access to decrypt the data in NAND flash. Innodisk 2.5″ SATA SSD 3TG6-P supports several standard features, including TRIM, NCQ, and S.M.A.R.T and compliant with TCG OPAL 2.01 and IEEE 1667.

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 2.5″ SATA SSD 3TG6-P is available in follow capacities:

2.5″ SATA SSD 3TG6-P 128GB   2.5″ SATA SSD 3TG6-P 256GB

2.5″ SATA SSD 3TG6-P 512GB   2.5″ SATA SSD 3TG6-P 1TB

2.5″ SATA SSD 3TG6-P 2TB   2.5″ SATA SSD 3TG6-P 4TB

Figure 1: Innodisk 2.5″ SATA SSD 3TG6-P

1.3 SATA Interface

Innodisk 2.5″ SATA SSD 3TG6-P supports SATA III interface, and backward compliant with SATA I and SATA II.

1.4 2.5-inch Form Factor

The Industry-standard 2.5-inch form factor design with metal material case is easy for installation, which has a compact design 69.85mm (W) x 100.00mm (L) x 6.90mm (H)

2. Product Specifications

2.1 Capacity and Device Parameters

2.5″ SATA SSD 3TG6-P device parameters are shown in Table 1.

Table 1: Device parameters

Capacity	LBA	Cylinders	Heads	Sectors	User Capacity(MB)
128GB	234441648	16383	16	63	114473
256GB	468862128	16383	16	63	228936
512GB	937703088	16383	16	63	457862
1TB	1875385008	16383	16	63	915715
2TB	3750748848	16383	16	63	1831420
4TB	7501497696	16383	16	63	3662840

2.2 Performance

Burst Transfer Rate: 6.0Gbps

Table 2: Performance- 64 Layers 3D TLC[1]

Capacity	Unit	128GB	256GB	512GB	1TB	2TB	4TB
Sequential[2] Read (max.)	MB/s	560	560	560	530	520	490
Sequential[2] Write (max.)	MB/s	135	280	510	495	450	410
4KB Random[2] Read (QD32)	IOPS	41,000	73,000	74,000	82,000	78,000	71,000
4KB Random[2] Write (QD32)	IOPS	37,000	49,000	68,000	68,000	61,000	52,000

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

Table 3: Performance- 96 Layers 3D TLC[1]

Capacity	Unit	256GB	512GB	1TB	2TB	4TB[2]
Sequential[3] Read (max.)	MB/s	540	540	500	480	490
Sequential[3] Write (max.)		130	300	430	430	430
4KB Random[3] Read (QD32)	IOPS	43,000	74,000	80,000	80,000	65,000
4KB Random[3] Write (QD32)		36,000	63,000	57,000	55,000	55,000

Note: 1. Performance based on CrystalDiskMark 6.0.2 with file size 1000MB of Queue Depth 32

2. Single PCB inside

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

Table 4: Performance- 112 Layers 3D TLC[1]

Capacity	Unit	128GB	256GB	512GB	1TB	2TB	4TB[2]
Sequential[3] Read (max.)	MB/s	420	550	550	510	500	450
Sequential[3] Write (max.)		90	170	350	460	460	430
4KB Random[3] Read (Q32T1)	IOPS	30,000	54,000	74,000	72,000	71,000	78,000
4KB Random[3] Write (Q32T1)		22,000	44,000	62,000	56,000	57,000	58,000

Note: 1. Performance based on CrystalDiskMark 6.0.2 with file size 1000MB of Queue Depth 32

2. Single PCB inside

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

2.3 Electrical Specifications

2.3.1 Power Requirement

Table 5: Innodisk 2.5″ SATA SSD 3TG6-P Power Requirement

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

2.3.2 Power Consumption

Table 6: Typical Power Consumption

Mode	Power Consumption (W)
Read	5.1
Write	5.9
Idle	3.5
Boot-Up	8.5

Target: 4TB 2.5″ SATA SSD 3TG6-P

2.4 Environmental Specifications

2.4.1 Temperature Ranges

Table 7: Temperature range for 2.5″ SATA SSD 3TG6-P

Temperature	Range
Operating	Standard Grade: 0°C to +70°C
	Industrial Grade:-40°C to +85°C
Storage	-40°C to +85°C

2.4.2 Humidity

Relative Humidity: 10-95%, non-condensing

2.4.3 Shock and Vibration

Table 8: Shock/Vibration Testing for 2.5″ SATA SSD 3TG6-P

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 2.5″ SATA SSD 3TG6-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 9: 2.5″ SATA SSD 3TG6-P MTBF

Product	Condition	MTBF (Hours)
Innodisk 2.5″ SATA SSD 3TG6-P	Telcordia SR-332 GB, 25°C	>3,000,000

2.5 CE and FCC Compatibility

2.5″ SATA SSD 3TG6-P conforms to CE and FCC requirements.

2.6 RoHS Compliance

2.5″ SATA SSD 3TG6-P is fully compliant with RoHS directive.

2.7 Reliability

Parameter	Value	
Flash endurance	3,000 P/E cycles	
Error Correct Code	Support	
Data Retention	Under 40 ˚C: 10 Years at Initial NAND status ； 1 Year at NAND Life End	
TBW* (Total Bytes Written) Unit:TB		
Capacity	**Sequential workload**	**Client workload**
128GB	341	289
256GB	682	578
512GB	1364	1154
1TB	2663	2308
2TB	5327	4615
4TB	10654	9231

*Note:

1. Sequential: Mainly sequential write.

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

2.5″ SATA SSD 3TG6-P support following transfer mode:

Serial ATA III 6.0Gbps

Serial ATA II 3.0Gbps

Serial ATA I 1.5Gbps

2.9 Pin Assignment

Innodisk 2.5″ SATA SSD 3TG6-P uses a standard SATA pin-out. See Table 8 for 2.5″ SATA SSD 3TG6-P pin assignment.

Table 10: Innodisk 2.5″ SATA SSD 3TG6-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

* DGS25-XXXM72XX1(A/B)QF
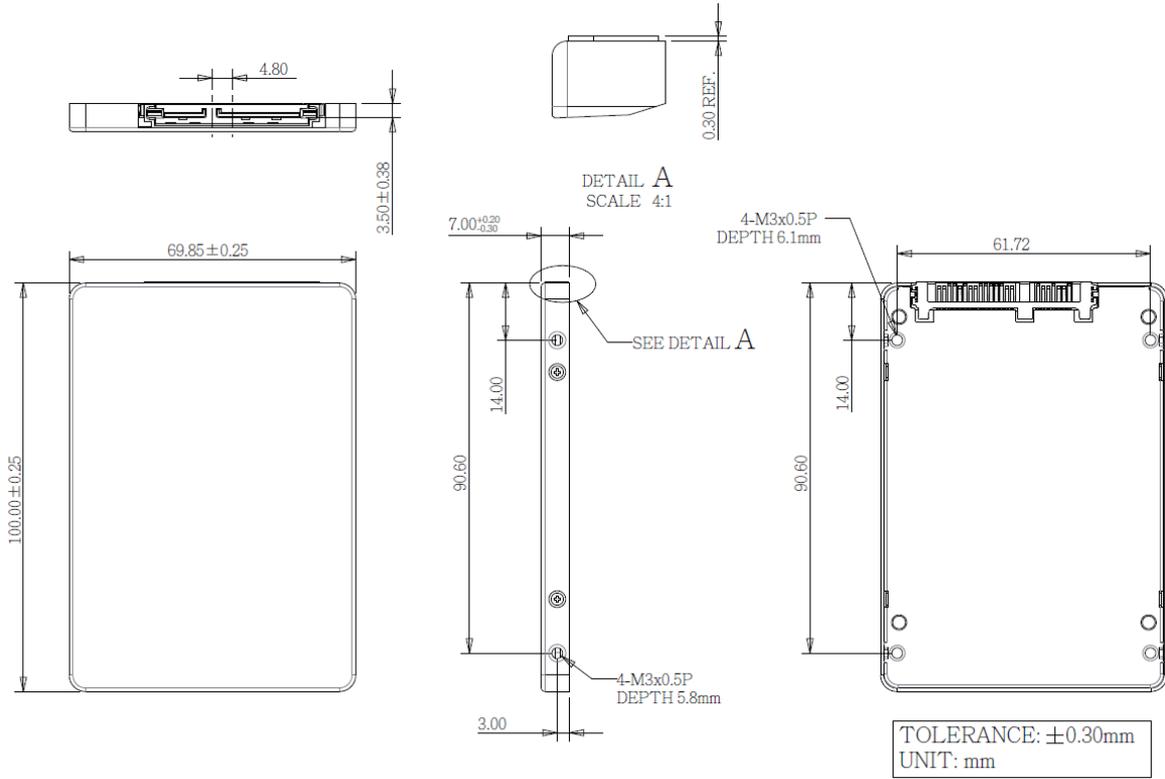
* DGS25-XXXM72XX3QF
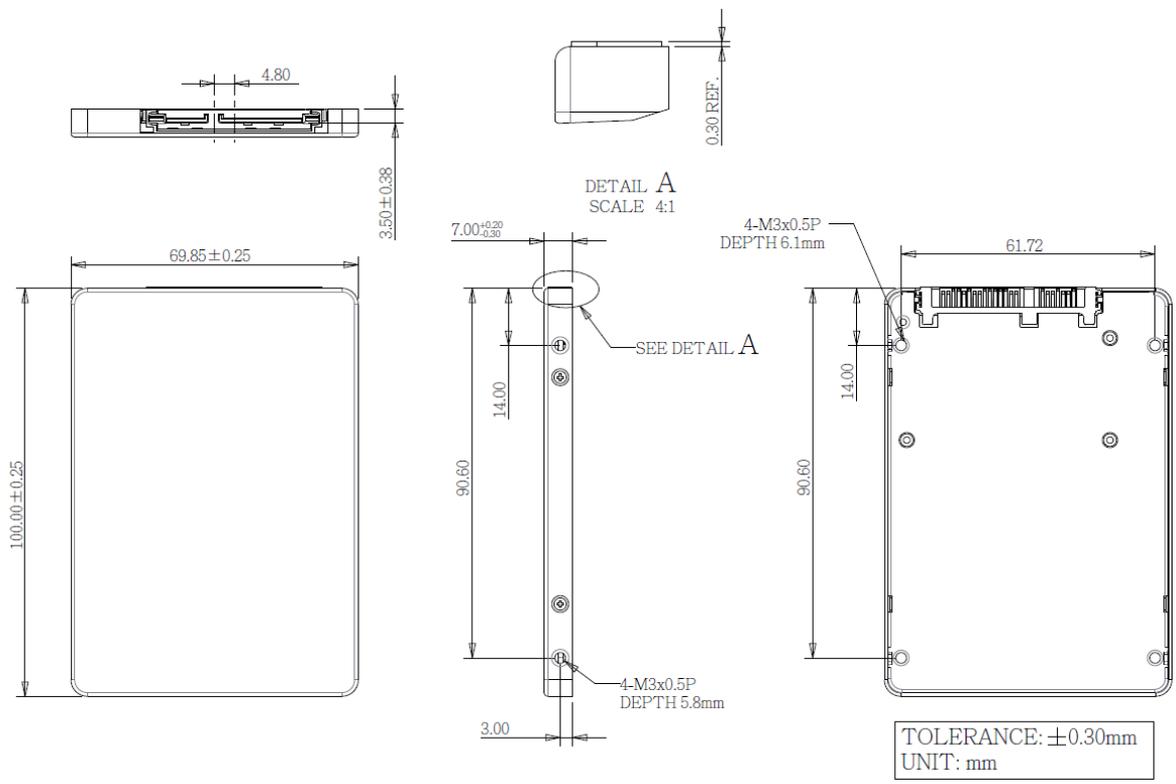
2.11 Assembly Weight

An Innodisk 2.5" SATA SSD 3TG6-P within 3D TLC flash ICs, 2TB's weight is 90 grams approx.

2.12 Seek Time

Innodisk 2.5" SATA SSD 3TG6-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 3TG6-P 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 2 shows the operation of Innodisk 2.5" SATA SSD 3TG6-P from the system level, including the major hardware blocks.
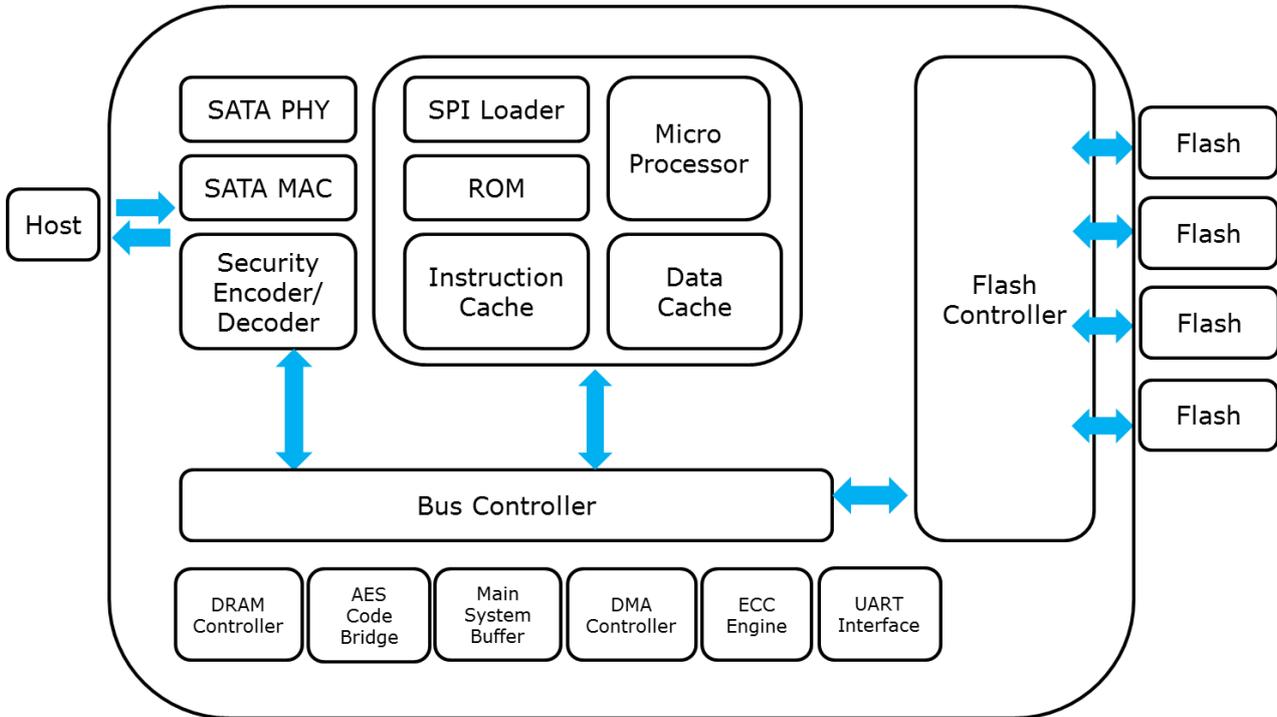
Figure 2: Innodisk 2.5" SATA SSD 3TG6-P with AES Block Diagram

Innodisk 2.5" SATA SSD 3TG6-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. The AES engine was built-in the ID201 controller. When 2.5" SATA SSD 3TG6-P is initiated with Firmware, AES engine will generate a random number to be an AES key. Each SSD has a unique AES key when it leaves the factory.

* iCell is optional feature with different part number.

3.2 SATA Controller

Innodisk 2.5" SATA SSD 3TG6-P is designed with 88SS1080 built-in 256bits AES engine, a SATA III 6.0Gbps 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 Error Detection and Correction

Innodisk 2.5″SATA SSD 3TG6-P 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 2.5″ SATA SSD 3TG6-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 (Optional)

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 3TG6-P can ensure all data can be written to disk without any data loss. Once the SSD controller receives this feedback signal, the SSD firmware triggers a mechanism to write the data into flash storage. As a result, iCell is able to provide power during power outage, preventing any data loss from happening.
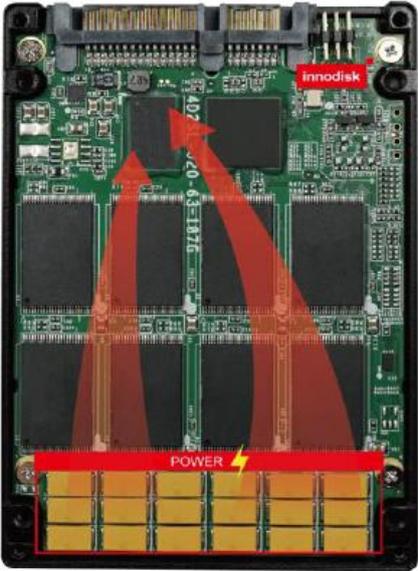
Figure 3: Diagram of 2.5″ SATA SSD with iCell

3.9 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 start-up and shut-down to maintain device performance and ensure data integrity.

3.10 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 2.5″ SATA SSD 3TG6-P series is default enable the Die RAID function for the industrial application.

3.11 Quick Erase (Optional)

Quick Erase function is designed for emergency data erase in few seconds by providing ATA command.
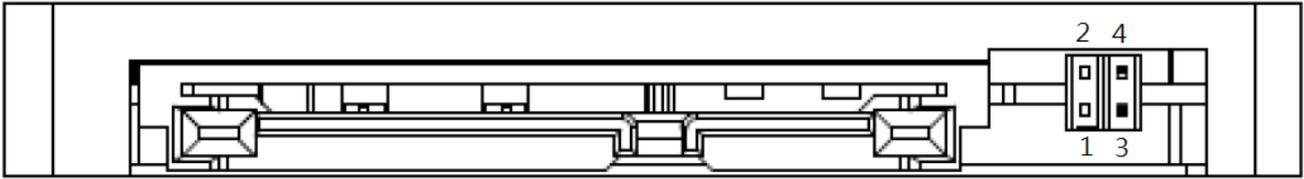
3.11.1 Quick Erase Command

- Protocol: No Data

-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

3.12 2.5" SATA SSD 3TG6-P AES function flow chart

In order to complete the physical security layer of protection, encryption needs to be paired with an ATA user password by ATA security command. After setting the authorized key by ATA security command, every time when you power on the system with SSD encrypted, you will be requested for a password to access the SSD. If the password is correct, the SSD will run well; if not, then you will not be able to access the SSD then.

Figure 4: Innodisk 2.5" SATA SSD 3TG6-P AES flow chart

3.12.1 Encrypted Key Management

Innodisk 3TG6-P SSD includes two methods of key management to apply to different applications. The first is a standard approach that allows the firmware to generate a random number and a unique key when it leaves the factory. This method ensures that the user can easily apply the SSD with the data encrypted key. Another approach is to meet unique customer requirements with an encrypted key generated by an SSD from the SATA interface host. The SSD must keep the encrypted key value when receiving the reset commands. This method works best for the SSD as a removable device in different systems. Innodisk provides the test tool to execute the AES hardware encryption. This user-friendly tool, developed by Innodisk Corporation, allows the customer to use/test encryption functions.

3.12.2 Authorized Key Management

In order to complete the physical security layer of protection, encryption needs to be bundled with an ATA user password provided by an ATA Security command. Unlike the AES key, the authorized key must be set by the user via the BIOS configuration. Every time you power on the system with SSD encryption, a password request prompt is sent to access the SSD. If the password is correct, the SSD will run well; if not, you will not be able to access the SSD.

Command	Command Code
SECURITY SET PASSWORD	0XF1
SECURITY UNLOCK	0XF2

|	
SECURITY ERASE PREPARE	0XF3
SECURITY ERASE UNIT	0XF4
SECURITY FREEZE LOCK	0XF5
SECURITY DISABLE PASSWORD	0XF6

3.12.3 TCG OPAL

OPAL is a set of specifications for features of data storage devices that enhance security. The Trusted Computing Group's Storage Work Group publishes these specifications. Innodisk 3TG6-P is compliant with TCG OPAL 2.01[*1]. The capability of TCG OPAL Security mode allows multiple users with independent access control to read/write/erase independent data areas (LBA ranges). Each locking range adjusts by authenticated authority. Note that by default there is a single "Global Range" that encompasses the whole user data area. In TCG Opal Security Mode, Revert, Revert SP and GenKey command can erase all of data including global range and locking range; in the meantime generate the new encrypted key.

*1. You need to install TCG OPAL software to implement OPAL function, which is supplied by TCG OPAL software developed company

*2. ATA Security cannot work with TCG OPAL together.

3.13 Write Protect (Optional)

Write Protect can be triggered by sending ATA command or shorting GPIO Pins (GPIO Pins optional for certain Part Numbers). When Write Protect function is enabled, 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. Write Protect pin is set for optional and available for customization (Pin 3/4).
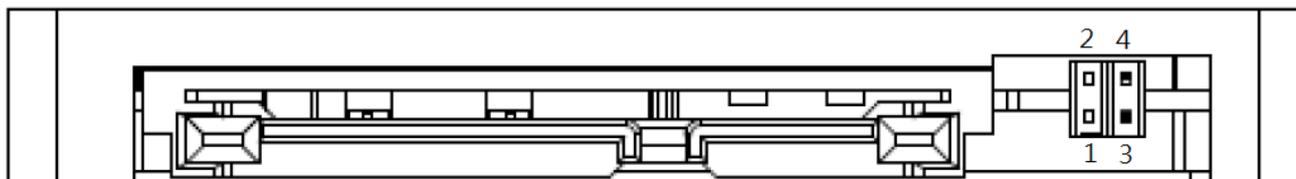
3.13.1 Write Protect Command

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

Execute Enable Write Protect command for inputs information

Register	7	6	5	4	3	2	1	0
Features				17h				

Sector Count	41h					
LBA Low	Na					
LBA Mid	Na					
LBA High	Na					
Device	1	1	1	0	Na	
Command	82h					

-Normal Outputs

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.

3.13.2 Disable Write Protect Command

This command disable SSD's write protect feature.

-Protocol: Non Data Command

-Inputs

Execute Disable Write Protect command for inputs information

Register	7	6	5	4	3	2	1	0
Features	18h							
Sector Count	41h							
LBA Low	Na							

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

-Normal Outputs

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

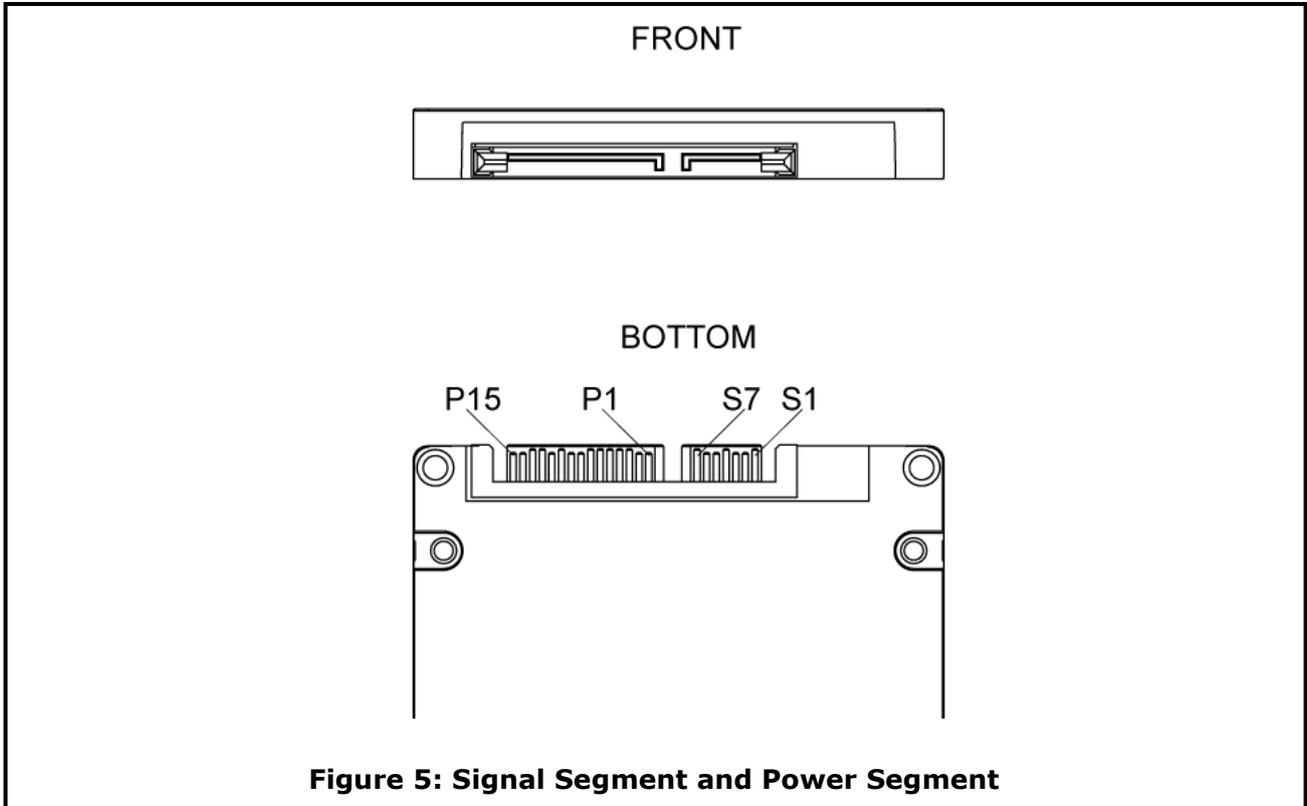**BSY** will be cleared to zero indicating command completion

DRDY will be set to one.

DF (Device Fault) will be cleared to zero.

DRQ will be cleared to zero

4. Installation Requirements

4.1 2.5″ SATA SSD 3TG6-P Pin Directions

Figure 5: Signal Segment and Power Segment

## 4.2 Electrical Connections for 2.5″ SATA SSD 3TG6-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. (Torque value is 2.0 ~ 2.5 Kgf.cm)

➢ SATA single cable (7-pin, Maximum length l 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.
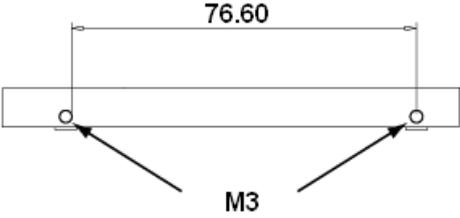
Figure 6: 2.5″ SATA SSD 3TG6-P Mechanical Screw Hole

4.4 Device Drive

No additional device drives are required. Innodisk 2.5″ SATA SSD 3TG6-P can be configured as a boot device.

5. SMART Feature Set

Innodisk 3TG6-P series support the SMART command set and defines some vendor-specific data to report SMART attributes of SSD.

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

5.1 SMART Attributes

Innodisk 3TG6-P series SMART data attributes are listed in following table.

Attribute ID (hex)	Raw Attribute Value						Attribute Name
5 (05h)	LSB			MSB	00	00	00	Later Bad
9 (09h)	LSB			MSB	00	00	00	Power-On hours Count
12 (0Ch)	LSB			MSB	00	00	00	Drive Power Cycle Count
163 (A3h)	LSB					MSB	00	Total Bad Block Count
165 (A5h)	LSB			MSB	00	00	00	Max Erase count
167 (A7h)	LSB			MSB	00	00	00	Avg Erase count
169 (A9h)	LSB	00	00	00	00	00	00	Device Life
170 (AAh)	LSB					MSB	00	Spare Block Count
171 (ABh)	LSB					MSB	00	Program fail count
172 (ACh)	LSB					MSB	00	Erase fail count
184 (B8h)	LSB			MSB	00	00	00	Error Corrected Count
187 (BBh)	LSB			MSB	00	00	00	Reported Uncorrect Count
192 (C0h)	LSB			MSB	00	00	00	Unexpected Power Loss Count
194 (C2h)	Cur.*	00	MIN	00	MAX	03	Cur.*	Temperature
229 (E5h)	ID 0	ID 1	ID 2	ID 3	ID 4	ID 5	00	Flash ID
235 (EBh)		MSB	LSB	MSB	LSB	MSB	LSB	Later bad block info (Read/Write/Erase)
241 (F1h)	LSB					MSB	00	Total LBA written(LBA=32MB)
242 (F2h)	LSB					MSB	00	Total LBA read(LBA=32MB)

Cur. * =Current

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	G	S	2	5	-	A	2	8	M	7	2	E	C	1	Q	F	(P)	-	X	X
Description	Disk	2.5″ SATA SSD					Capacity			Category			Flash mode	Operation Temp.	Internal Control	CH.	Flash	icell		Customized Code	

Definition	
Code 1ˢᵗ (Disk)	**Code 13ᵗʰ (Flash mode)**
D : Disk	E: 64 layers 3D TLC
	G: 96 layer 3D TLC
	K: 112 layers 3D TLC
Code 2ⁿᵈ ~ 5ᵗʰ (Form Factor)	**Code 14ᵗʰ (Operation Temperature)**
GS25: 2.5″ SATA SSD	C: Standard Grade (0℃~ +70℃)
Code 7ᵗʰ ~9ᵗʰ (Capacity)	W: Industrial Grade (-40℃~ +85℃)
A28: 128GB	**Code 15ᵗʰ (Internal control)**
B56: 256GB	1/A/B: PCB type
C12:512GB	3/C: Slim inside
01T: 1TB	
02T: 2TB	
04T: 4TB	**Code 16ᵗʰ (Channel of data transfer)**
Code 10ᵗʰ ~12ᵗʰ (Series)	D: Dual Channels
M72: SATA 3TG6-P with AES 256bits	Q: Quad Channels
	Code 17ᵗʰ (Flash Type)
	F: Kioxia 3D TLC
	Code 18th (iCell)
	P: Optional
	Code 20ᵗʰ ~21ᵗʰ (Customized code)