

MLC

2.5" Rugged Metal SATA III SSD

HERMES-JI Series

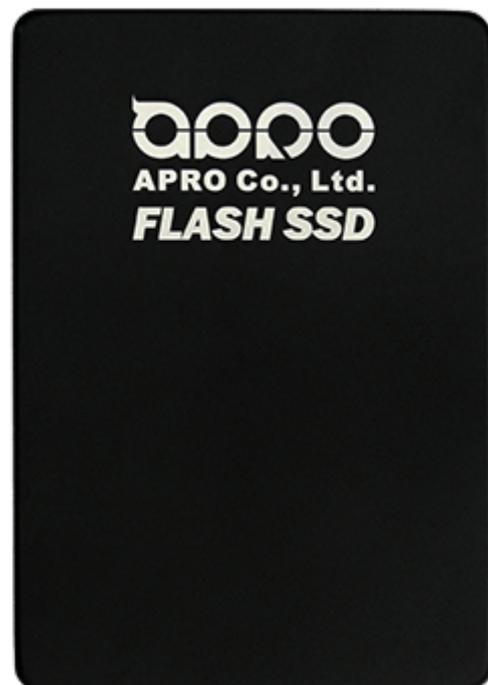
(7mm Thickness)

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Product Features

■ Flash IC

- TOSHIBA 15nm NAND Flash IC.
- Multi-Level Cell (MLC) management

■ Compatibility

- SATA Revision 3.1
- SATA 1.5Gb/s; SATA 3Gb/s & SATA 6Gb/s data transfer rate.
- ATA-8 command set

■ Additional Capabilities

- S.M.A.R.T.*¹ (Self-Monitoring, Analysis and Reporting Technology) feature set support.
- Thermal Monitor for SSD's temperature.
- Native Command Queuing (NCQ) support.
- TRIM maintenance command support.
- Static wear-leveling algorithm

■ Mechanical

- Standard 2.5" SATA Flash Disk form-factor
- SATA 7-pin (data) + 15-pin (power connector) SATA Interface
- Dimension: 100.0 mm x 69.9 mm x 7.0 mm
- Weight: 50.0 g / 1.76 oz.

■ Power Operating Voltage 5V(+/-) 5%

- Read Mode: 170.0 mA (max.)
- Write Mode: 310.0 mA (max.)
- Idle Mode: 60.0 mA (max.)

■ Performance (Maximum value) *²

- Sequential Read: 422.0 MB/sec. (max.)
- Sequential Write: 147.0 MB/sec. (max.)

■ Capacity

- 4GB, 8GB, 16GB, 32GB, 64GB, 128GB, 256GB and 512GB.

■ Reliability

- **TBW:** Up to 153.6 TBW at 512GB Capacity.
(Client workload by JESD-219A)
- **ECC:** Automatic 40 bits per 1024 bytes error correction (ECC) and retry capabilities.
- **Temperature:** (Operating)
Standard Grade: 0°C ~ +70°C
Wide Temp. Grade: -40°C ~ +85°C
- **Vibration:** 70Hz ~2,000Hz, 20G.
- **Shock:** 0.5ms, 1500 G, 3 axes

■ Certifications and Declarations

- **Certifications:** CE & FCC
- **Declarations:** RoHS & REACH

Remarks:

1. Support official S.M.A.R.T. Utility.
2. Sequential performance is based on CrystalDiskMark 5.1.2 with file size 1000MB

Order Information

I. Part Number List

◆ APRO MLC 2.5" Rugged Metal SATA III SSD HERMES-JI Series

Product Picture	Capacity	Standard grade (0°C ~ 70°C)	Wide Temp Grade (-40°C ~ +85°C)
	4GB	SR7SF004G-JJCTMB-(T)	WR7SF004G-JJCTMB-(T)C
	8GB	SR7SF008G-JJCTMB-(T)	WR7SF008G-JJCTMB-(T)C
	16GB	SR7SF016G-JJCTMB-(T)	WR7SF016G-JJCTMB-(T)C
	32GB	SR7SF032G-JJCTMB-(T)	WR7SF032G-JJCTMB-(T)C
	64GB	SR7SF064G-JJCTMB-(T)	WR7SF064G-JJCTMB-(T)C
	128GB	SR7SF128G-JJCTMB-(T)	WR7SF128G-JJCTMB-(T)C
	256GB	SR7SF256G-JJCTMB-(T)	WR7SF256G-JJCTMB-(T)C
	512GB	SR7SF512G-JJCTMB-(T)	WR7SF512G-JJCTMB-(T)C

➤ **HERMES-J Series: 4GB ~ 32GB / HERMES-I Series: 64GB~512GB**

➤ C : Special conformal coating

II. Part Number Decoder:

X1 X2 X3 X4 X5 X6 X7 X8 X9 — **X11 X12 X13 X14 X15 X16** — **X18 X19 X20**

X1 : Grade

S: Standard Grade – operating temp. 0° C ~ 70 ° C

W: Wide Temp Grade- operating temp. -40° C ~ +85 ° C

X2 : The material of case

R : Rugged Metal

X3 X4 X5 : Product category

7SF : 2.5" SATA SSD 7mm/th.

X6 X7 X8 X9 : Capacity

004G:	4GB	064G:	64GB
008G:	8GB	128G:	128GB
016G:	16GB	256G:	256GB
032G:	32GB	512G:	512GB

X11 : Controller

J : HERMES Series

X12 : Controller version

A, B, C.....

X13 : Controller Grade

C : Commercial grade

X14 : Flash IC

T : Toshiba MLC-NAND Flash IC

X15 : Flash IC grade / Type

M : MLC-NAND Flash IC

X16 : MLC Technology

B : Toshiba 15nm MLC

X18 X19 X20 : Reserved for specific requirement

Blank : Standard product w/o thermal sensor and conformal-coating

T : Thermal Sensor (optional).

C : Conformal coating (optional)

Revision History

Revision	Description	Date
1.0	Initial release	2016/3/16
1.1	Add the option for thermal sensor	2018/11/02
1.2	Updated Version	2018/11/28
2.0	Updated Document form	2019/05/29

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1. Introduction

APRO MLC 2.5" Rugged Metal SATA III SSD HERMES-JI Series provides high capacity flash memory Solid State Drive (SSD) that electrically complies with Serial ATA 3.1 (SATA) standard. APRO MLC 2.5" Rugged Metal SATA III SSD HERMES-JI Series support SATA 1.5Gb/s; SATA 3Gb/s & SATA 6Gb/s data transfer rate with high performance.

The available disk capacities are 4GB, 8GB, 16GB, 32GB, 64GB, 128GB, 256GB and 512GB. The operating temperature grade is optional for Standard grade 0°C ~ 70°C and wide temp grade with conformal coating supports -40°C ~ +85°C. The data transfer performance by sequential read is up to 422.0 MB/sec, and sequential write is up to 147.0 MB/sec.

APRO MLC 2.5" Rugged Metal SATA III SSD HERMES-JI Series products do not need additional driver; the disk can be configured as a boot device or data storage device. It prevents data loss caused by sudden power failure based on enhanced power cycling technology and more capacitors. S.M.A.R.T. utility will be provided and users will be not only monitor the operation status of SSD, but also visualize Wear-Leveling status with graphics.

Figure 1 shows a block diagram of the APRO MLC 2.5" Rugged Metal SATA III SSD HERMES-JI Series.

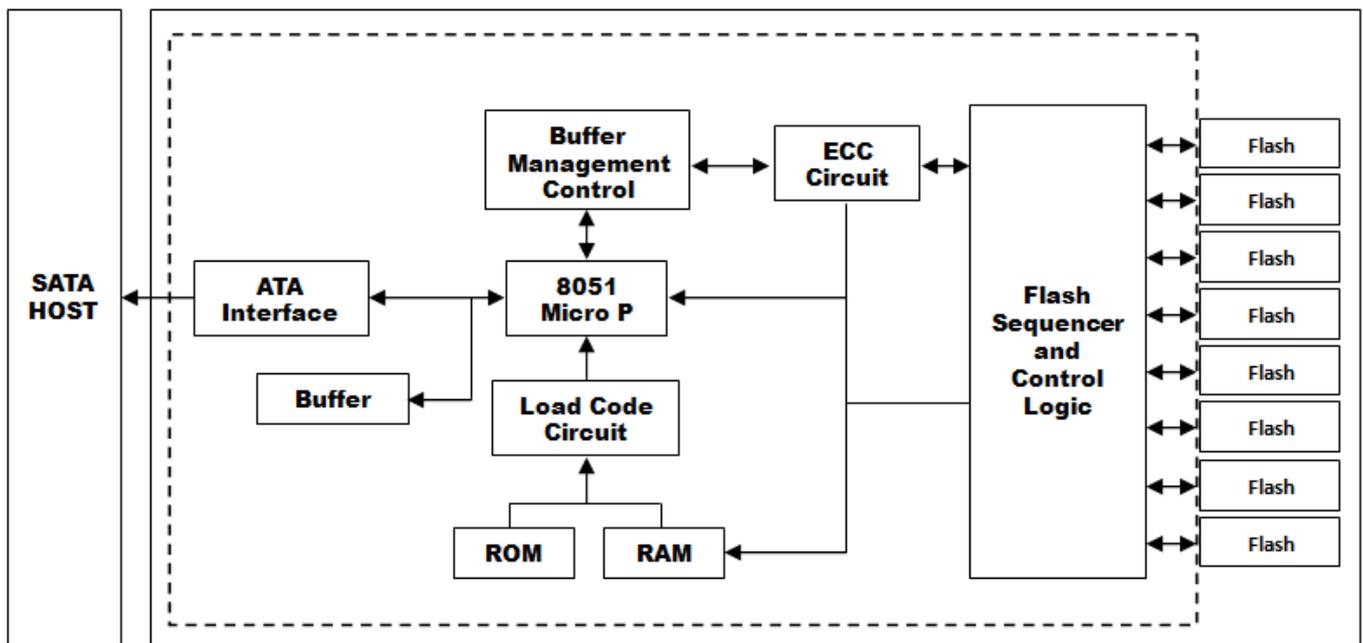


Figure 1: APRO MLC 2.5" Rugged Metal SATA III Flash SSD HERMES-JI Series block diagram

1.1. Scope

This document describes features, specifications and installation guide of APRO MLC 2.5" Rugged Metal SATA III SSD HERMES-JI Series. In the appendix, there provides order information, warranty policy, RMA/DOA procedure for the most convenient reference.

1.2. Flash Management Technology - Static Wear Leveling

In order to gain the best management for flash memory, APRO MLC 2.5" Rugged Metal SATA III SSD HERMES-JI Series supports Static Wear-leveling technology to manage the Flash system. The life of flash memory is limited; the management is to increase the life of the flash product.

A static wear-leveling algorithm evenly distributes data over an entire Flash cell array and searches for the least used physical blocks. The identified low cycled sectors are used to write the data to those locations. If blocks are empty, the write occurs normally. If blocks contain static data, it moves that data to a more heavily used location before it moves the newly written data. The static wear leveling maximizes effective endurance Flash array compared to no wear leveling or dynamic wear leveling.

1.3. Bad Block Management

➤ Early Bad Block

The fault block generated during the manufacturing process of NAND Flash is called Early Bad Block.

➤ Later Bad Block

In the process of use, as the number of operations of writing and erasing increases, a fault block is gradually generated, which is called a Later Bad Block.

Bad block management is a management mechanism for a bad block to be detected by the control IC and mark bad blocks in the NAND Flash and improve the reliability of data access. The bad block management mechanism of the control IC will establish a **Bad Block Table** when the NAND Flash is started for the first time, and will also record the errors found in the process of use in the bad block table, and data is ported to new valid blocks to avoid data loss.

In order to detect the initial bad blocks to handle run time bad blocks, APRO MLC 2.5" Rugged Metal SATA III SSD HERMES-JI Series provides the **Bad Block Management** scheme. It remaps a bad block to one of the reserved blocks so that the data contained in one bad block is not lost and new data writes on a bad block is avoided.

2. Product Specifications

For all the following specifications, values are defined at ambient temperature and nominal supply voltage unless otherwise stated.

2.1. System Environmental Specifications

Table 1: Environmental Specification

APRO MLC 2.5" Rugged Metal SATA III SSD HERMES-JI Series		Standard Grade SR7SFxxxG-JJ(I)CTMB	Wide Temp Grade WR7SFxxxG-JJ(I)CTMB-C
Temperature	Operating:	0°C ~ +70°C	-40°C ~ +85°C
	Non-operating:	-20°C ~ +80°C	-50°C ~ +95°C
Humidity	Operating & Non-operating:	10% ~ 95% non-condensing	
	Frequency/Acceleration:	70 Hz to 2K Hz, 20G, 3 axes	
Shock	Operating & Non-operating:	0.5ms, 1500 G, 3 axes	
Electrostatic Discharge (ESD)	Temperature:	24°C	
	Relative Humidity:	49% (RH)	
	+/-4KV:	Device functions are affected, but EUT will be back to its normal or operational state automatically.	

2.2. System Power Requirements

Table 2: Power Requirement

APRO MLC 2.5" Rugged Metal SATA III SSD HERMES-JI Series		
DC Input Voltage (VCC)		+5V±5%
Maximum average value	Reading Mode :	170.0 (max.)
	Writing Mode :	310.0 (max.)
	Idle Mode :	60.0 (max.)

2.3. System Performance

Table 3: System Performances

Data Transfer Mode supporting	Serial ATA Gen-III (6.0Gb/s = 768MB/s)								
Average Access Time	0.2 ms (estimated)								
Maximum Performance	Capacity	4GB	8GB	16GB	32GB	64GB	128GB	256GB	512GB
	Sequential Read (MB/s)	104.4	104.4	103.8	201.6	382.0	422.0	422.0	422.0
	Sequential Write(MB/s)	24.3	24.3	21.7	43.0	82.6	147.0	147.0	147.0

Note: The performance was measured using CrystalDiskMark by file size 1000MB (QD32).

2.4. System Reliability

Table 4: System Reliability

Wear-leveling Algorithms	Static wear-leveling algorithms
Bad Blocks Management	Supportive
ECC Technology	40 bits per 1024 bytes
Thermal Sensor	Supportive
Erase counts	NAND MLC Flash Cell Level : 3K P/E Cycles
Capacity	TBW(TB)
4GB	1.2
8GB	2.4
16GB	4.8
32GB	9.6
64GB	19.2
128GB	38.4
256GB	76.8
512GB	153.6

Note:

- Client workload by JESD-219A.
- The endurance of SSD could be varying based on user behavior, NAND endurance cycles, and write amplification factor. It is not guaranteed by flash vendor.

2.5. Physical Specifications

Refer to Table 5 and see Figure 2 for APRO MLC 2.5" Rugged Metal SATA III SSD HERMES-JI Series physical specifications and dimensions.

Table 5: Physical Specifications of APRO MLC 2.5" Rugged Metal SATA III SSD HERMES-JI Series

Length:	100.0 mm
Width:	69.90 mm
Thickness:	7.0 mm
Weight:	50.0 g / 1.76 oz.

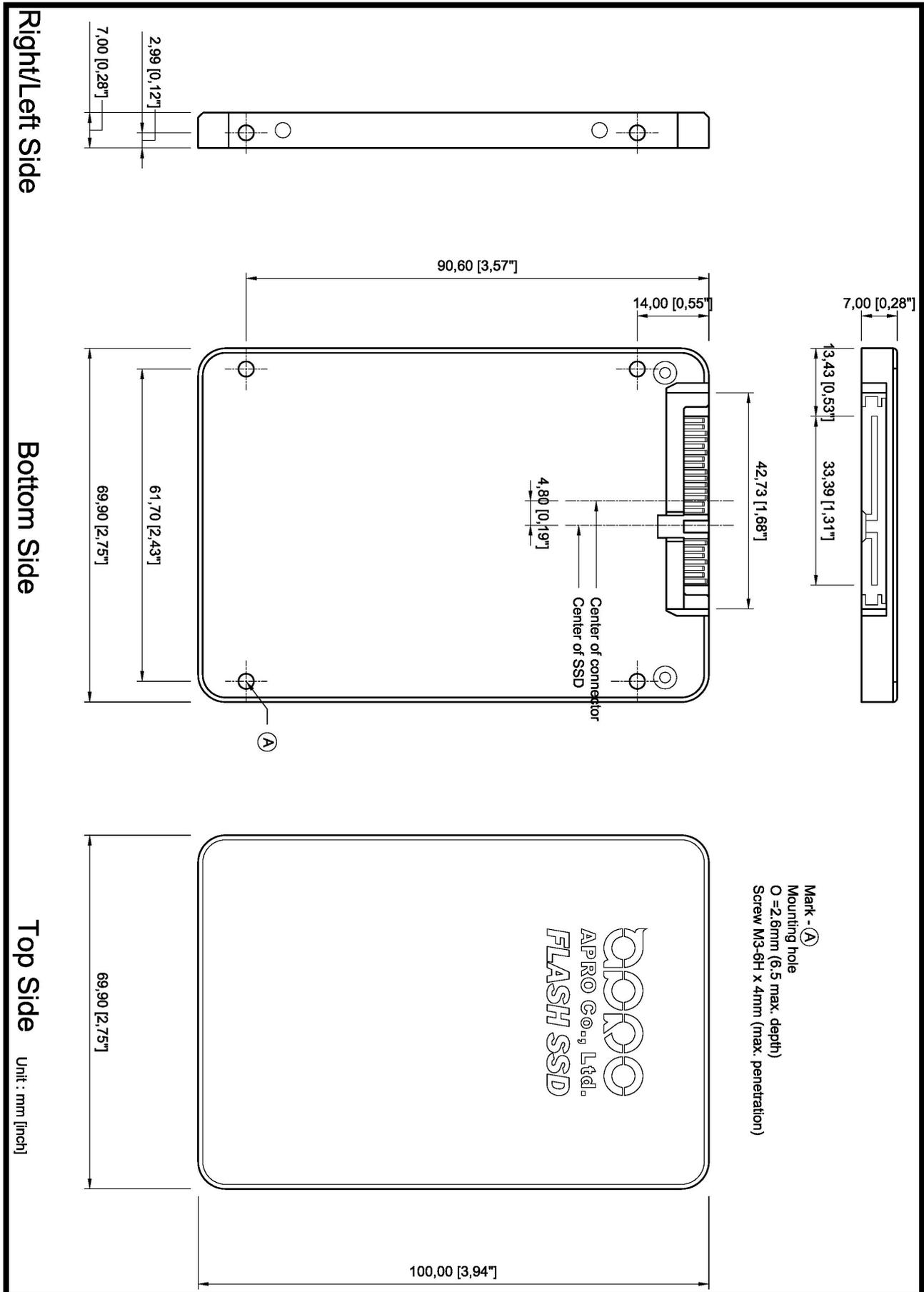


Figure 2: APRO MLC 2.5" Rugged Metal SATA III Flash SSD HERMES-JI Series Dimension

2.6. Conformal coating

Conformal coating is a protective, dielectric coating designed to conform to the surface of an assembled printed circuit board. Commonly used conformal coatings include silicone, acrylic, urethane and epoxy. APRO applies only silicone on APRO storage products upon requested especially by customers. The type of silicone coating features good thermal shock resistance due to flexibility. It is also easy to apply and repair.

Conformal coating offers protection of circuitry from moisture, fungus, dust and corrosion caused by extreme environments. It also prevents damage from those Flash storages handling during construction, installation and use, and reduces mechanical stress on components and protects from thermal shock. The greatest advantage of conformal coating is to allow greater component density due to increased dielectric strength between conductors.

APRO use MIL-I-46058C silicon conformal coating

2. Interface Description

2.1. MLC 2.5" SATA III Flash SSD HERMES-JI Series interface

APRO MLC 2.5" Rugged Metal SATA III SSD HERMES-JI Series is equipped with standard 7 pins + 15 pins Serial ATA connector.

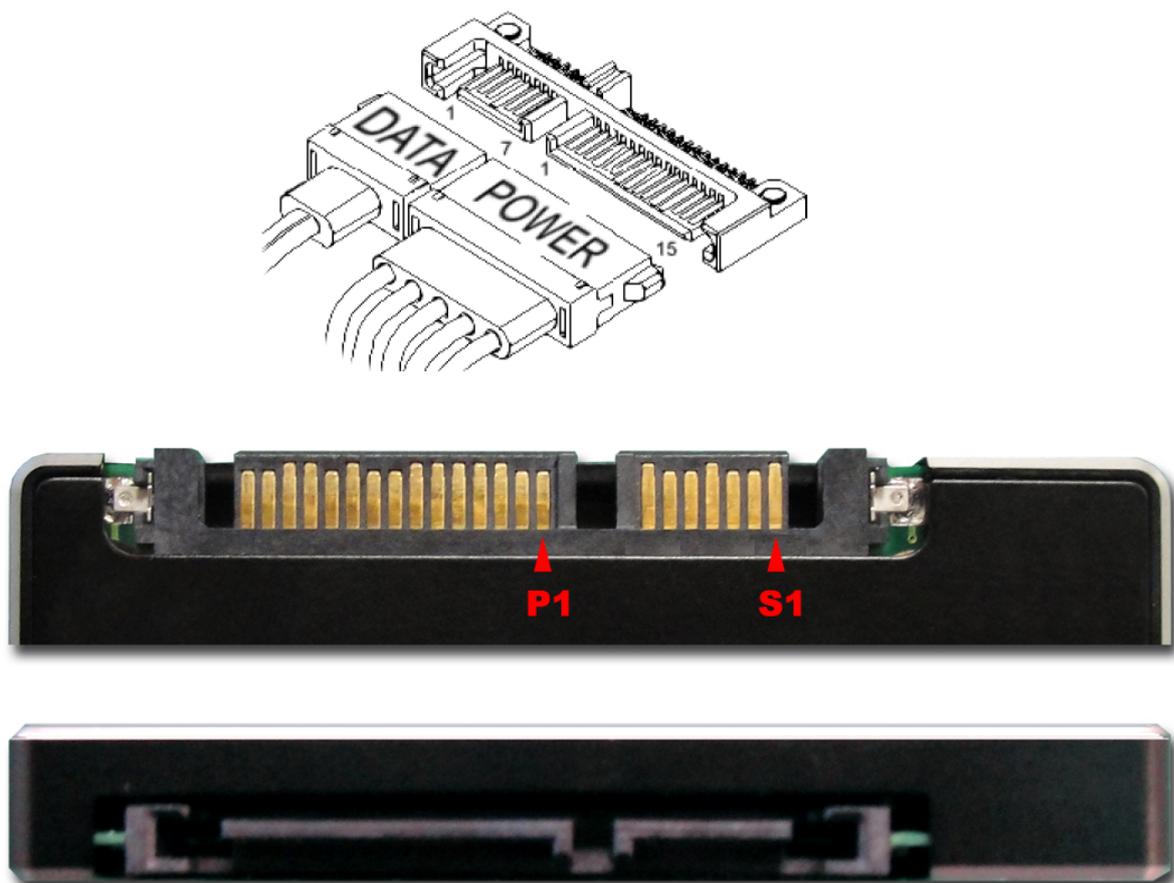


Figure 3: The connectors of APRO MLC 2.5" Rugged Metal SATA III Flash SSD HERMES-JI Series

2.2. Pin Assignments

APRO MLC 2.5" Rugged Metal SATA III SSD HERMES-JI Series operates with standard SATA pin-out.

The pin assignments are listed in below table 6.

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	DEVSLP	NA
P4	GND	NA
P5	GND	NA
P6	GND	NA
P7	5V	5V Power, Pre-Charge
P8	5V	5V Power
P9	5V	5V Power
P10	GND	NA
P11	Reserved	Device Activity Signal / Disable Staggered Spin up
P12	GND	NA
P13	Not Used (12V pre-charge)	NA
P14	Not Used (12V)	NA
P15	Not Used (12V)	NA

Table 7 - Pin Assignments

Appendix A: Limited Warranty

APRO warrants your MLC 2.5" Rugged Metal SATA III SSD HERMES-JI Series against defects in material and workmanship for the life of the drive. The warranty is void in the case of misuse, accident, alteration, improper installation, misapplication or the result of unauthorized service or repair. The implied warranties of merchantability and fitness for a particular purpose, and all other warranties, expressed or implied, except as set forth in this warranty, shall not apply to the products delivered. In no event shall APRO be liable for any lost profits, lost savings or other incidental or consequential damages arising out of the use of, or inability to use, this product.

BEFORE RETURNING PRODUCT, A RETURN MATERIAL AUTHORIZATION (RMA) MUST BE OBTAINED FROM APRO.

Product shall be returned to APRO with shipping prepaid. If the product fails to conform based on customers' purchasing orders, APRO will reimburse customers for the transportation charges incurred.

WARRANTY PERIOD:

- **MLC (Standard grade / Wide temp. grade) 2 years / Within 3K Erasing Counts**

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