



October 2011

Product Specification

Rugged Metal 2.5" SATA II MLC SSD

-HERMES Series-

Doc-No: 100-M2SFJA-01V4



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Revision History

Revision	Description	Date
1.0	<i>Preliminary release</i>	<i>2010/4/24</i>
1.1	<i>Wide temperature with special conformal coating items added</i>	<i>2010/5/27</i>
1.2	<i>New Rugged Metal case release and Warranty period modified</i>	<i>2010/7/14</i>
1.3	<i>Table 7: Pin Assignments revised</i>	<i>2011/4/20</i>
1.4	<i>General revised</i>	<i>2011/10/5</i>

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1. Introduction

APRO Rugged Metal 2.5" SATA II MLC SSD – HERMES Series provide high capacity flash memory Solid State Drive (SSD) that electrically complies with Serial ATA 2.6 (SATA) standard. APRO Rugged Metal 2.5" SATA II MLC SSD – HERMES Series support SATA Gen-II (3.0 GB/s) with high performance. The main used flash memories are MLC-NAND type flash memory chips. The available disk capacities are 8GB, 16GB, 32GB, 64GB, 128GB and 256GB.

The operating temperature grade is optional for commercial grade 0°C ~ 70°C and Industrial grade conformal coating supports -40°C ~ +85°C. The data transfer performance by sequential read is up to 167.8 MB/sec, and sequential write is up to 92.1 MB/sec.

The APRO Rugged Metal 2.5" SATA II MLC SSD products provide a high level interface to the host computer. This interface allows a host computer to issue commands to the Rugged Metal 2.5" SATA II MLC SSD to read or write blocks of memory. Each sector is protected by a powerful 8 bits or 15 bits error correction (ECC). APRO Rugged Metal 2.5" SATA II MLC SSD HERMES Series intelligent controller manages interface protocols, data storage and retrieval as well as ECC, defect handling and diagnostics, power management and clock control.

Figure 1 shows a block diagram of the used high tech Rugged Metal 2.5" SATA II MLC SSD controller.

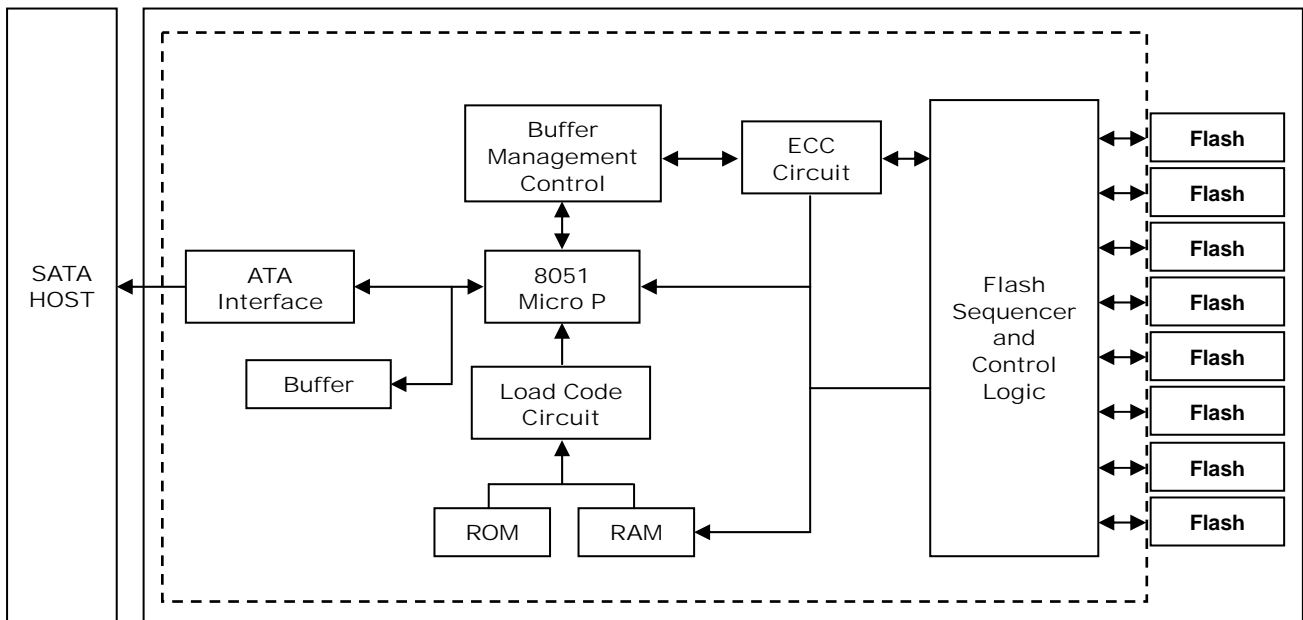


Figure 1: APRO Rugged Metal 2.5" SATA II MLC SSD HERMES Series controller block diagram

1.1. Scope

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

1.2. System Features

- MLC-NAND type flash technology
- Standard 2.5" SATA Flash Disk form-factor (9.5mm height)
- SATA 7-pin (data) + 15-pin (power connector) SATA Interface
- Extremely Rugged Metal casing to endure harsh environments
- Includes USB 2.0 Mini-B type connector which can be used as an external SSD drive (performance up to 35 MB/sec)
- SATA 1.0a and SATA 2.6 specification compliance
- SMART (Self-Monitoring, Analysis and Reporting Technology) function supported.
- Non-volatile memory and no moving parts
- MLC Flash SSD standard grade capacity from 8GB up to 256GB
- Sequential read performance up to 167.8 MB/sec
- Sequential write performance up to 92.1 MB/sec
- Automatic 8 bits or 15 bits error correction (ECC) and retry capabilities
- +5 V $\pm 10\%$ operation
- Shock : 1,500G, compliance to MIL-STD-810F
- Vibration : 5G, compliance to MIL-STD-810F
- Very high performance, very low power consumption
- Low weight, Noiseless
- Commercial grade supports operating temperature 0°C to +70°C, and Industrial Grade, -40°C to +85°C with special conformal coating treatment on PCBA

1.3. Flash Management Technology - Static Wear Leveling

In order to gain the best management for flash memory, APRO 2.5" SATA II MLC SSD HERMES 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.

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 Rugged Metal 2.5" SATA II MLC SSD		Commercial Grade	Industrial Grade
HERMES Series		SR2SFxxxG-JACMC	WR2SFxxxG-JACMC/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	
Vibration	Operating & Non-operating:	15G, compliance to MIL-STD-810F	
Shock	Operating & Non-operating:	1,500G, compliance to MIL-STD-810F	

2.2. System Power Requirements

Table 2: Power Requirement

APRO Rugged Metal 2.5" SATA II MLC SSD		Commercial Grade
HERMES Series		SR2SFxxxG-JACMC
DC Input Voltage (VCC) 100mV max. ripple(p-p)		5V±10%
+5V Current (Maximum average value)	Reading Mode :	450mA (max.)
	Writing Mode :	500mA (max.)
	Idle Mode :	320mA (max.)

2.3. System Performance

Table 3: System Performances

Data Transfer Mode supporting		Serial ATA Gen-II (3.0Gb/s = 380MB/s)					
Average Access Time		0.2 ms (estimated)					
mini-B USB connector (Read & Write)		Up to 35 MB/sec					
Maximum Performance	Capacity	8GB	16GB	32GB	64GB	128GB	256GB
	Sequential Read (MB/s)	92.4	167.4	167.8	167.8	167.8	152.5
	Sequential Write(MB/s)	25.4	53.6	92.1	90	90	89
The number of Flash IC		4pcs	8pcs	16pcs	16pcs	16pcs	16pcs

Note:

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(1). All values quoted are typically at 25°C and nominal supply voltage.

(2). Testing of the Rugged Metal 2.5" SATA II MLC SSD maximum performance was performed under the following platform:

- Computer with AMD 3.0GHz processor
- Windows XP Professional operating system

2.4. System Reliability

Table 4: System Reliability

Wear-leveling Algorithms	Static Wear-leveling
Bad Blocks Management	Supportive
ECC Technology	8 bits per 512 bytes in an ECC block
Endurance	<ul style="list-style-type: none">● Un-limited Read Cycles● Endurance Management enables five years minimal useful life
Insertion	10,000 times

2.5. Physical Specifications

Refer to Table 5 and see Figure 3 for Rugged Metal 2.5" SATA II MLC SSD HERMES Series physical specifications and dimensions.

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

Length:	99.70 mm / 4.0 in
Width:	69.90 mm / 2.75 in
Thickness:	9.50 mm / 0.37 in
Weight:	115.00 g / 4.06 oz

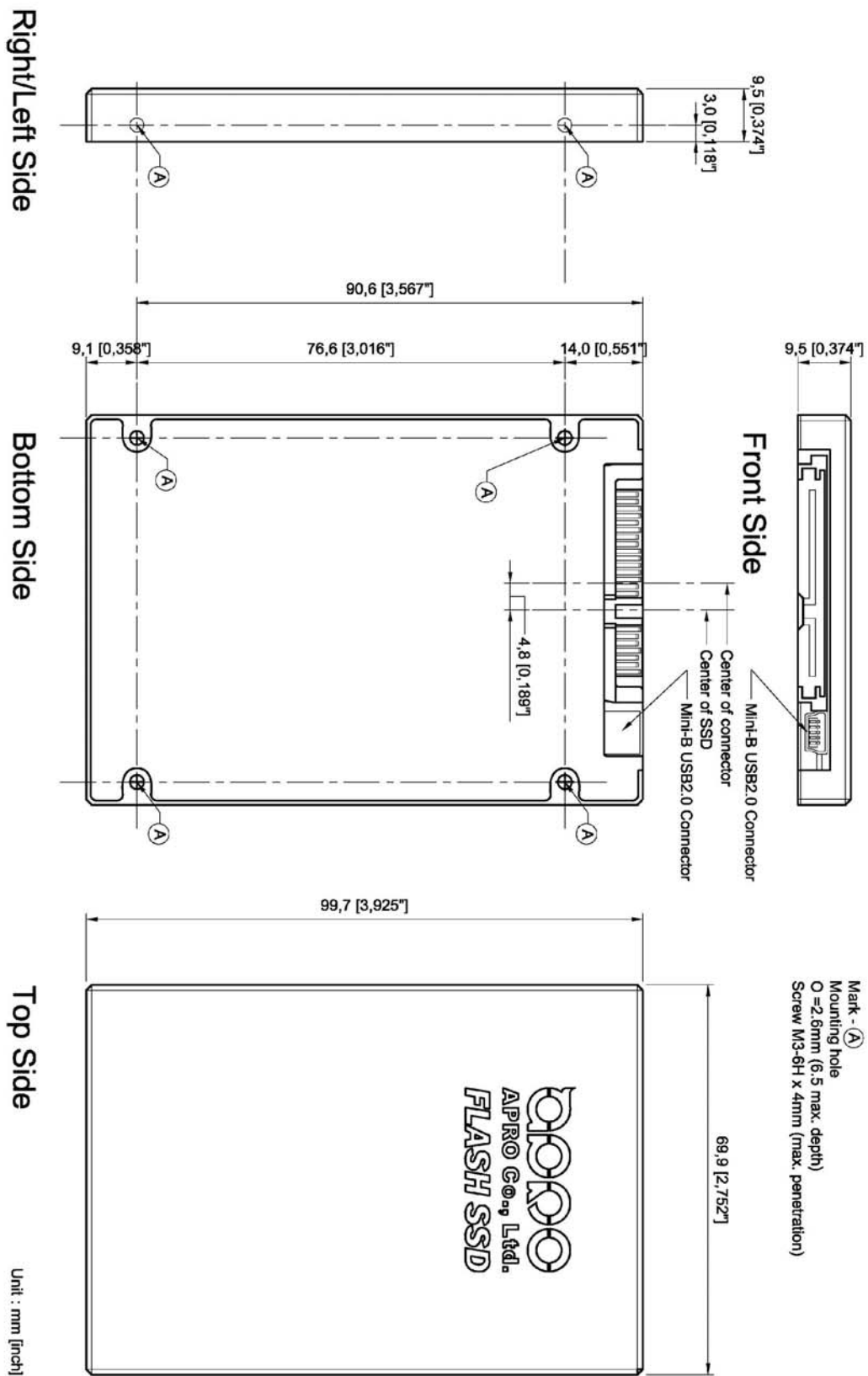


Figure 2: APRO Rugged Metal 2.5" SATA II MLC SSD Dimension

Product Specification

2.5.1. 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 storages 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 uses MIL-I-46058C silicon conformal coating.

2.6. Capacity Specifications

APRO Rugged Metal 2.5" SATA II MLC SSDs are built-in mainly MLC -NAND Type Flash memory chips. The Table 6 shows the part number of applied Flash memory chips for each card.

Table 6: Card Configuration vs. Samsung NAND MLC part number

Card capacity	Samsung MLC flash memory part number * Q'TY
8GB	K9F8G08U0M (8Gb) or equal * 8
16GB	K9GAG08U0M (16Gb) or equal * 8
32GB	K9LBG08U1M (32Gb) or equal * 8
64GB	K9LBG08U1M (32Gb) or equal * 16
128GB	K9HCG08U5M (64Gb) or equal * 16
256GB	K9MDG08U5M (128Gb) or equal * 16

3. Interface Description

3.1. APRO Rugged Metal 2.5" SATA II MLC SSD interface

APRO Rugged Metal 2.5" SATA II MLC SSD comes with 7 pins + 15 pins Serial ATA connector and mini-B USB connector.

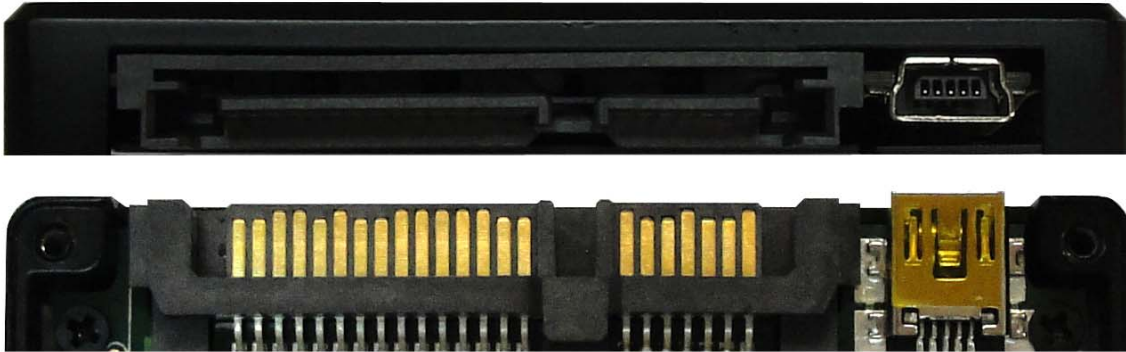


Figure 3 :The connectors of 2.5" SATA II MLC SSD

3.2. Pin Assignments

There are total of 7 pins in the signal segment and 15 pins in the power segment. The pin assignments are listed in below table 7.

Table 7 - Pin Assignments

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

Key and Spacing separate signal and power segments		
P1	NC	NC
P2	NC	NC
P3	NC	NC
P4	GND	

Product Specification

Key and Spacing separate signal and power segments		
P5	GND	
P6	GND	
P7	V5	5V Power, Pre-Charge
P8	V5	5V Power
P9	V5	5V Power
P10	GND	
P11	DAS/DSS	Device Activity Signal / Disable Staggered Spin up
P12	GND	
P13	NC	NC
P14	NC	NC
P15	NC	NC

Notes:

1. All pins are in a signal row with a 1.27 mm (0.050" pitch).
2. The commands on the mating sequence in forward table apply to the case of backplane blind mate connector only. In this case, the mating sequences are:
 - (1) The pre-charge power pins and other ground pins.
 - (2) The signal pins and the rest of the power pins.

4. Electrical Specification

4.1. Device Electrical Characteristics

Table 8 - Absolute Maximum Ratings

Parameter	Symbol	Condition	Min	Max	Unit
Analog power supply	AVDDH		-0.5	6	V
Digital I/O power supply	DVDD		-0.5	6	V
Digital I/O input voltage	VI(D)		-0.4	DVDD+0.4	V
Storage temperature	TSTORAGE		-55	140	°C

Table 9 - Recommended Power Supply Operation Conditions

Parameter	Symbol	Condition	Min	Typical	Max	Unit
DC Power Supply	VDD		-0.3		+5.5	V
Input voltage	VIN		-0.3		+5.5	V
Output voltage	VOOUT		-0.3		+3.8	
Operating Temperature	TA	Standard	0		+70	°C
		Industrial	-40		+85	°C
Storage Temperature	TST	Standard	-20		+80	°C
		Industrial	-55		+95	°C

5. Functional Description

5.1. ATA Commands

The commands supported ATA/ATAPI-6 commands; certain obsolesced commands are also supported. The supported commands are listed in Table 10.


Table 10 - ATA Commands Supported

Command	Code	Support	Ext
Check Power Mode	E5H	Yes	Yes
Download Microcode	92H	Yes	Yes
Flush Cache	E7H	Yes	Yes
Identify Device	ECH	Yes	Yes
Idle	E3H	Yes	Yes
Idle immediate	E1H	Yes	Yes
Initialize Device Parameters	91H	Yes	Yes
Read Multiple	C4H	Yes	Yes
Read Sector(s)	20H	Yes	Yes
Read Verify Sector	40H	Yes	Yes
Read DMA	C8H	Yes	Yes
Recalibrate	10H	Yes	Yes
Set Features	EFH	Yes	Yes
Set Multiple Mode	C6H	Yes	Yes
Set Sleep Mode	E6H	Yes	Yes
SMART	B0H	Yes	Yes
Standby	E2H	Yes	Yes
Standby Immediate	E0H	Yes	Yes
Security Set Password	F1H	Yes	Yes
Security Unlock	F2H	Yes	Yes
Security Erase Prepare	F3H	Yes	Yes
Security Erase Unit	F4H	Yes	Yes
Security Freeze Lock	F5H	Yes	Yes
Security Disable Password	F6H	Yes	Yes
Write Multiple	C5H	Yes	Yes
Write Sector	30H	Yes	Yes
Write DMA	CAH	Yes	Yes

Appendix A: Ordering Information

1. Part Number List

◆ APRO Rugged Metal 2.5" SATA II MLC SSD – HERMES Series

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Industrial Grade (-40°C ~ +85°C)
	8GB	SR2SF008G-JACMC	WR2SF008G-JACMC/C
	16GB	SR2SF016G-JACMC	WR2SF016G-JACMC/C
	32GB	SR2SF032G-JACMC	WR2SF032G-JACMC/C
	64GB	SR2SF064G-JACMC	WR2SF064G-JACMC/C
	128GB	SR2SF128G-JACMC	WR2SF128G-JACMC/C
	256GB	SR2SF256G-JACMC	WR2SF256G-JACMC/C

Notes:

C : Special conformal coating treated on whole PCBA which may support industrial grade operating temperature -40°C ~ +85°C

2. Part Number Decoder:

X1 **X2** **X3** **X4** **X5** **X6** **X7** **X8** **X9** – **X11** **X12** **X13** **X14** **X15** / **C**

X1 : Grade

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

W: Industrial Grade- operating tem. -40° C ~ +85 ° C

(Commercial grade with conformal coating)

X2 : The material of case

R : 2.5" Rugged Metal Casing

X3 **X4** **X5** : Product category

2SF : 2.5" SATA SSD

X6 **X7** **X8** **X9** : Capacity

008G: 8GB **064G**: 64GB

016G: 16GB **128G**: 128GB

032G: 32GB **256G**: 256GB

X11 : Controller

J : JMicron (HERMES Series)

X12 : Controller version

A, B, C.....

X13 : Controller Grade

C : Commercial grade

X14 : Flash IC

M : MLC-NAND Flash IC

X15 : Flash IC grade / Type

C : Commercial grade

C : Reserved for specific requirement

C : Conformal-coating

Appendix B: Limited Warranty

APRO warrants your Rugged Metal 2.5" SATA II MLC SSD 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:

- SR2SFxxxG-JACMC 1 year
- WR2SFxxxG-JACMC/C 1 year



The warranty period is able to extend. Please contact APRO and/or Your APRO distributors for more information.