



# Industrial mini SATA III Flash Module

HERMES-F Series

## **Product Specification**

INDUSTRIAL

Mini SATA III Flash Module

Version 01V0

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#### Revision History

Revision	Description	Date
1.0	Initial release	2014/6/13

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## 1. Introduction

APRO Mini SATA III Flash Module – HERMES-F Series provides high capacity flash memory Solid State Drive (SSD) that electrically complies with Serial ATA 3.0 (SATA) standard. APRO Mini SATA III Flash Module – HERMES-F Series support SATA Gen-III (6.0 GB/s) with high performance. The main used flash memories are SLC-NAND type flash memory chips. The available disk capacities are 4GB, 8GB, 16GB, 32GB and 64GB.

The operating temperature grade is optional for Standard grade 0°C ~ 70°C and wide temp grade supports -40°C ~ +85°C. The data transfer performance by sequential read is up to 542.7 MB/sec, and sequential write is up to 270.6 MB/sec.

APRO Mini SATA III Flash Module products provide a high level interface to the host computer. This interface allows a host computer to issue commands to the Mini SATA III Flash Module to read or write blocks of memory. Each sector is protected by a powerful 40 bits per 1024 bytes error correction (ECC). APRO Mini SATA III Flash Module HERMES-F 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 Mini SATA III Flash Module controller.

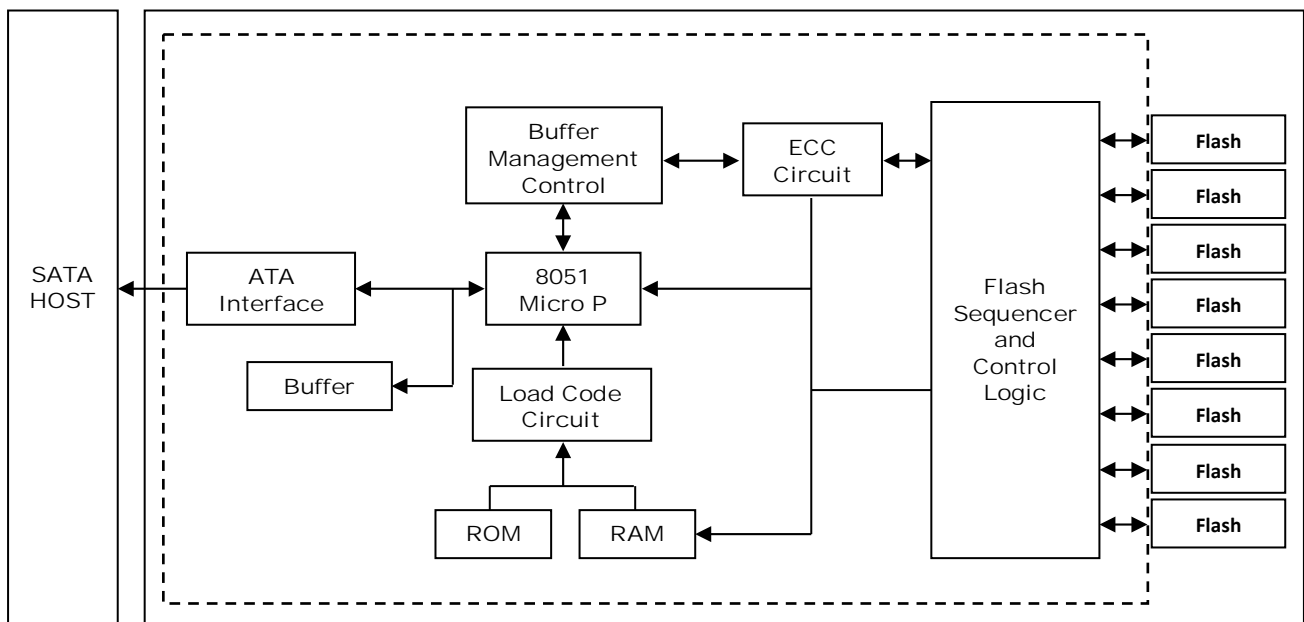


Figure 1: APRO Mini SATA III Flash Module HERMES-F Series controller block diagram

## 1.1. Scope

This document describes features, specifications and installation guide of APRO's Mini SATA III Flash Modules – HERMES-F Series. In the appendix, there provides order information, warranty policy, RMA/DOA procedure for the most convenient reference.

## 1.2. System Features

- SLC-NAND type flash technology
- Bootable for O.S. installation
- Standard mSATA form factor compliant with JEDEC MO-300 specification
- Mini PCI-e connector with 52 pins SATA pin out
- SATA 1.0a, SATA 2.6 and SATA 3.0 specification compliance
- SMART (Self-Monitoring, Analysis and Reporting Technology) function supported.
- Non-volatile memory and no moving parts
- SLC Flash SSD standard grade capacity from 4GB up to 64GB
- Sequential read performance up to 542.7 MB/sec
- Sequential write performance up to 270.6 MB/sec
- Automatic 40 bits per 1024 bytes error correction (ECC) and retry capabilities
- +3.3V  $\pm$  5% operation
- Shock : 0.5ms, 1500 G, 3 axes
- Vibration : 7 Hz to 2K Hz, 20G, 3 axes
- Very high performance, very low power consumption
- Low weight, Noiseless
- Standard grade supports operating temperature 0°C to +70°C, and Industrial Grade, -40°C to +85°C.

## 1.3. Flash Management Technology - Static Wear Leveling

In order to gain the best management for flash memory, APRO mini SATA III Flash Module HERMES-F 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 Mini SATA III Flash Module HERMES-F Series		Standard Grade SBMSMxxxG-JFCTC	Industrial Grade WBMSMxxxG-JFITI
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:	7 Hz to 2K Hz, 20G, 3 axes	
Shock	Operating & Non-operating:	0.5ms, 1500 G, 3 axes	

### 2.2. System Power Requirements

**Table 2: Power Requirement**

APRO Mini SATA III Flash Module HERMES-F Series		Standard Grade SBMSMxxxG-JFCTC
DC Input Voltage (VCC) 100mV max. ripple(p-p)		3.3V±5%
+5V Current (Maximum average value)	Reading Mode :	310 (max.)
	Writing Mode :	320 (max.)
	Idle Mode :	120 (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		0.1 ms (estimated)				
Maximum Performance	Capacity	4GB	8GB	16GB	32GB	64GB
	Sequential Read (MB/s)	220.4	400.6	458.3	542.7	TBC
	Sequential Write(MB/s)	58.8	125.1	133.2	270.6	
The number of Flash IC		1	2	2	2	

Note:

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

(2). Testing of the Mini SATA III Flash Module 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**

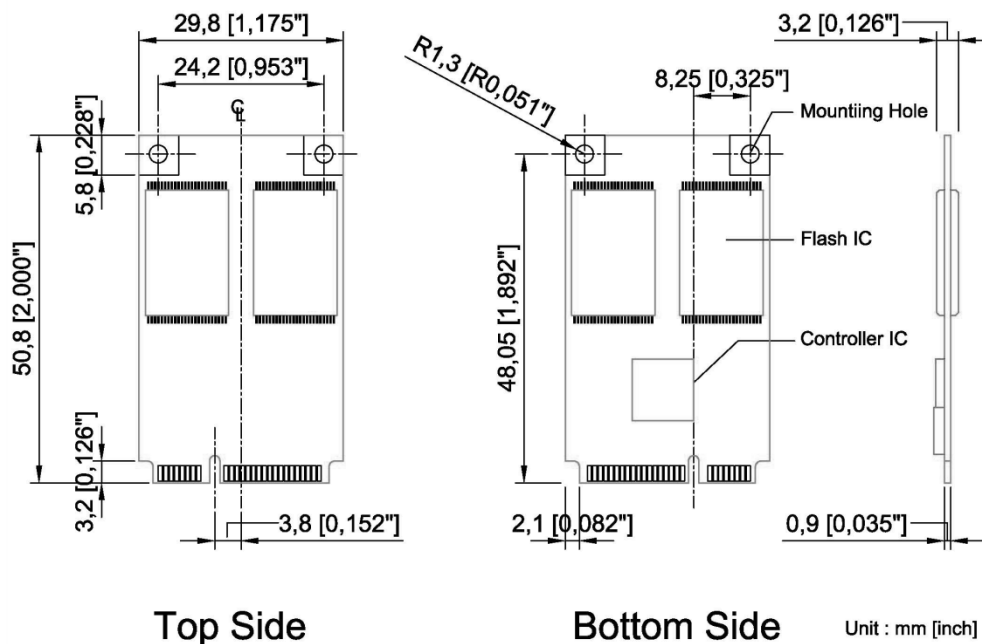
<b>Wear-leveling Algorithms</b>	Static Wear-leveling
<b>Bad Blocks Management</b>	Supportive
<b>ECC Technology</b>	40 bits per 1024 bytes
<b>Endurance</b>	Un-limited Read Cycles Endurance Management enables five years minimal useful life
<b>Data Retention</b>	10 years

## 2.5. Physical Specifications

Refer to Table 5 and see Figure 3 for Mini SATA III Flash Module HERMES-F Series physical specifications and dimensions.

**Table 5: Physical Specifications of APRO Mini SATA III Flash Module-HERMES-F Series**

<b>Length:</b>	50.80 mm
<b>Width:</b>	29.80 mm
<b>Thickness:</b>	3.20 mm
<b>Weight:</b>	8.00 g / 0.3 oz



**Figure 2: APRO Mini SATA III Flash Module Dimension**

### 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 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 uses MIL-I-46058C silicon conformal coating

## 3. Interface Description

### 3.1. APRO Mini SATA III Flash Module interface

APRO Mini SATA III Flash Module is equipped with mini PCI-e 52 pins SATA pin out

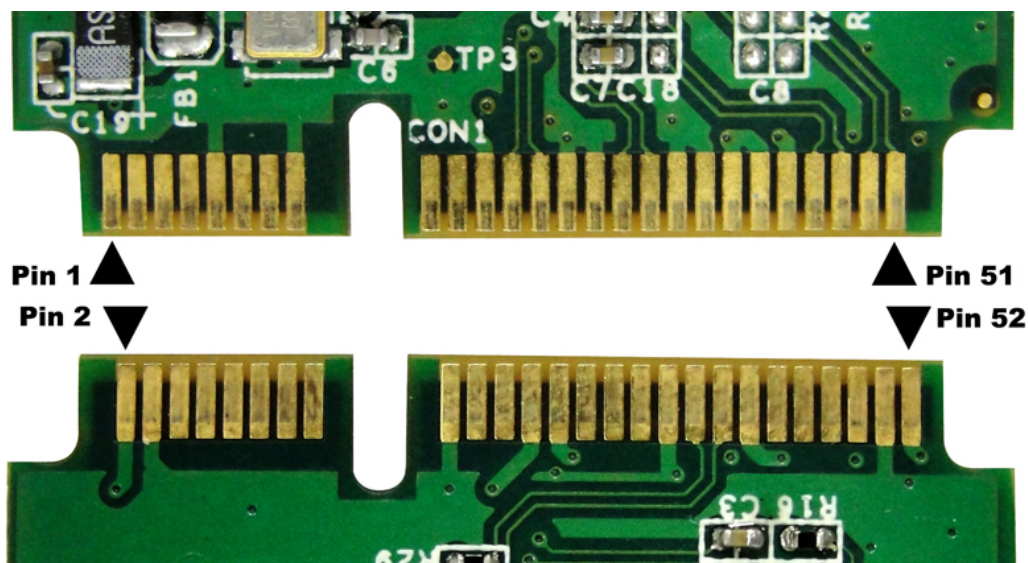


Figure 3 : The connectors of mini SATA Flash Module



### 3.2. Pin Assignments

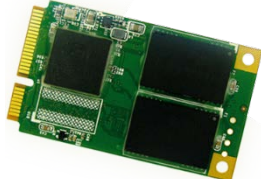
**Table 7 - Pin Assignments**

Signal Name	Pin #	Pin #	Signal Name
NC	1	2	+3.3V
NC	3	4	GND
NC	5	6	NC
NC	7	8	NC
GND	9	10	NC
NC	11	12	NC
NC	13	14	NC
GND	15	16	NC
NC	17	18	GND
NC	19	20	NC
GND	21	22	NC
TX+	23	24	+3.3V
TX-	25	26	GND
GND	27	28	NC
GND	29	30	NC
RX-	31	32	NC
RX+	33	34	GND
GND	35	36	NC
GND	37	38	NC
+3.3V	39	40	GND
+3.3V	41	42	NC
NC	43	44	NC
NC	45	46	NC
NC	47	48	NC
NC	49	50	GND
GND	51	52	+3.3V

## Appendix A: Ordering Information

### 1. Part Number List

#### ◆ APRO Mini SATA III Flash Module – HERMES-F Series

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Industrial Grade ( -40°C ~ +85°C )
	4GB	SBMSM004G-JFCTC(/C)	WBMSM004G-JFITI(/C)
	8GB	SBMSM008G-JFCTC(/C)	WBMSM008G-JFITI(/C)
	16GB	SBMSM016G-JFCTC(/C)	WBMSM016G-JFITI(/C)
	32GB	SBMSM032G-JFCTC(/C)	WBMSM032G-JFITI(/C)
	64GB	SBMSM064G-JFCTC(/C)	WBMSM064G-JFITI(/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**: Wide Temp Grade- operating temp. -40° C ~ +85 ° C  
 (Standard grade with conformal coating)

**X2** : The material of case

**B** : Bare

**X3 X4 X5** : Product category

**MSM** : mini SATA flash module

**X6 X7 X8 X9** : Capacity

<b>004G:</b>	4GB	<b>032G:</b>	32GB
<b>008G:</b>	8GB	<b>064G:</b>	64GB
<b>016G:</b>	16GB		

**X11** : Controller

**J** : JMicron (HERMES-F Series)

**X12** : Controller version

**A, B, C.....**

**X13** : Controller Grade

**C** : Commercial grade  
**I** : Industrial grade

**X14** : Flash IC

**T** : Toshiba SLC-NAND Flash IC

**X15** : Flash IC grade / Type

**C** : Commercial grade  
**I** : Industrial grade

**C** : Reserved for specific requirement

**C** : Conformal-coating

**Appendix B: Limited Warranty**

APRO warrants your Mini SATA III Flash Module 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:**

- **SBMSMxxxG-JFCTC(/C)**      **3 years**



- **WBMSMxxxG-JFITI(/C)**      **5 years**



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