



Industrial
MICRO SATA III
FLASH MODULE
HERMES-G Series

Product Specification

INDUSTRIAL

MICRO SATA III FLASH MODULE

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Revision History

Revision	Description	Date
1.0	Initial release	2014/6/13
1.1	Corrected Typo from HERMES-J to HERMES-G	2017/02/21
	Corrected Table 7 Physical Specifications	

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1. Introduction

APRO Industrial Micro SATA III Flash Module – HERMES-G Series provides high capacity flash memory Solid State Drive (SSD) that electrically complies with Serial ATA 3.0 (SATA) standard. APRO Industrial Micro SATA III Flash Module – HERMES-G 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 1GB, 2GB, 4GB, 8GB, 16GB and 32GB.

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 307.1 MB/sec, and sequential write is up to 133.2 MB/sec.

APRO Industrial Micro SATA III Flash Module provides a high level interface to the host computer. This interface allows a host computer to issue commands to the Industrial Micro 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 Industrial Micro SATA III Flash Module HERMES-G Series intelligent controller manages interface protocols, data storage and retrieval as well as ECC, defect handling and diagnostics, power management and clock control.

With the great flexibility to meet different SATA interface locations in systems, APRO Industrial Micro SATA III Flash Module comes with optional form-factor in vertical type and horizontal type. And the power operating voltage supports 5V. Particularly it is built-in power pin as the 7th pin of 7pin header (w/fuse) or power input power cable (w/o fuse).

Figure 1 shows a block diagram of the used high tech industrial Micro SATA III Flash Module controller.

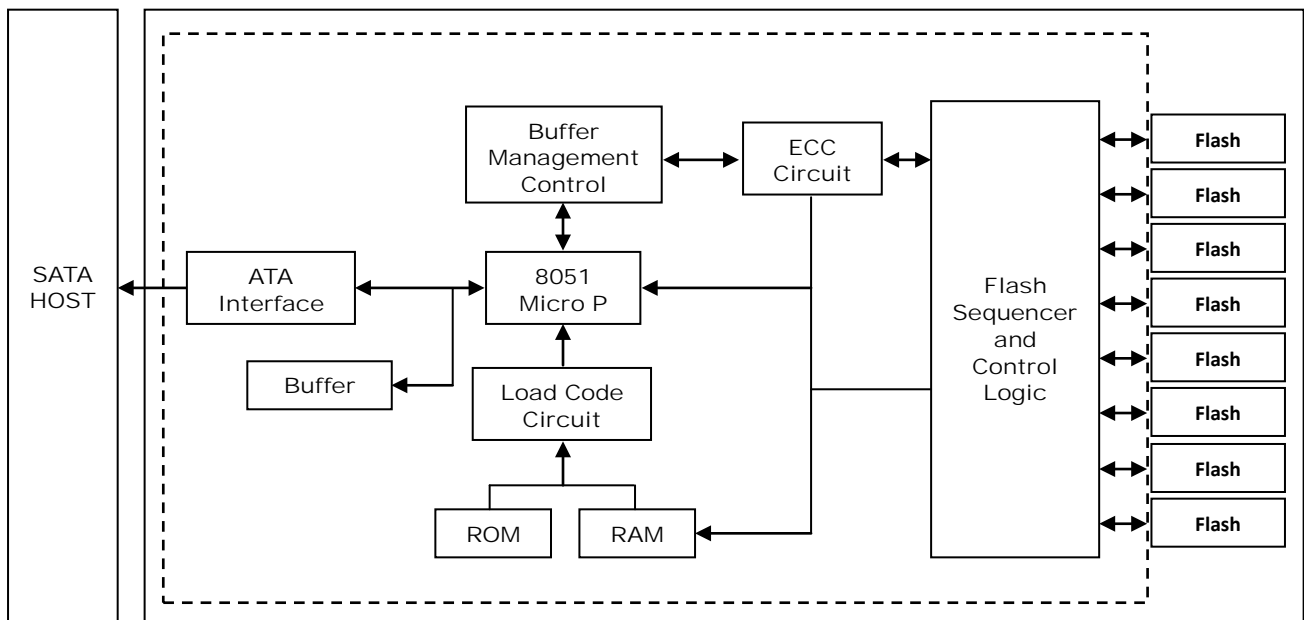


Figure 1: APRO Industrial Micro SATA III Flash Module HERMES-G Series controller block diagram

1.1. *Scope*

This document describes features, specifications and installation guide of APRO's Industrial Micro SATA III Flash Module – HERMES-G 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
- Standard 7 pins SATA female connector
- SATA 1.0a, SATA 2.6 and SATA 3.0 specification compliance
- Form-factor supports vertical and horizontal types
- SMART (Self-Monitoring, Analysis and Reporting Technology) function supported.
- Non-volatile memory and no moving parts
- Capacity from 1GB up to 32GB
- Sequential read performance up to 307.1 MB/sec
- Sequential write performance up to 133.2 MB/sec
- Automatic 40 bits per 1024 bytes error correction (ECC) and retry capabilities
- +5V \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 Industrial Micro SATA III Flash Module HERMES-G 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 Industrial Micro SATA III Flash Module HERMES-G Series		Standard Grade SBMSFxxxG-JGCTC	Industrial Grade WBMSFxxxG-JGITI
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 Industrial Micro SATA III Flash Module HERMES-G Series		Standard Grade SBMSFxxxG-JGCTC
DC Input Voltage (VCC) 100mV max. ripple(p-p)		5V±5%
+5V Current (Maximum average value)	Reading Mode :	120 (max.)
	Writing Mode :	130 (max.)
	Idle Mode :	100 (max.)

Table 3: Power Connector

Pin No.	Connector	
Pin 1	Vcc 5V	
Pin 2	GND	

2.3. System Performance

Table 4: 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	1GB	2GB	4GB	8GB	16GB	32GB
	Sequential Read (MB/s)	31.1	34.5	227.0	233.5	307.1	307.1
	Sequential Write(MB/s)	13.5	26.2	58.7	64.2	132.6	133.2
The number of Flash IC		1	1	1	1	1	1

Note:

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

(2). Testing of the Industrial Micro 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 5: System Reliability

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

2.5. Physical Specifications

Table 6: Form Factors

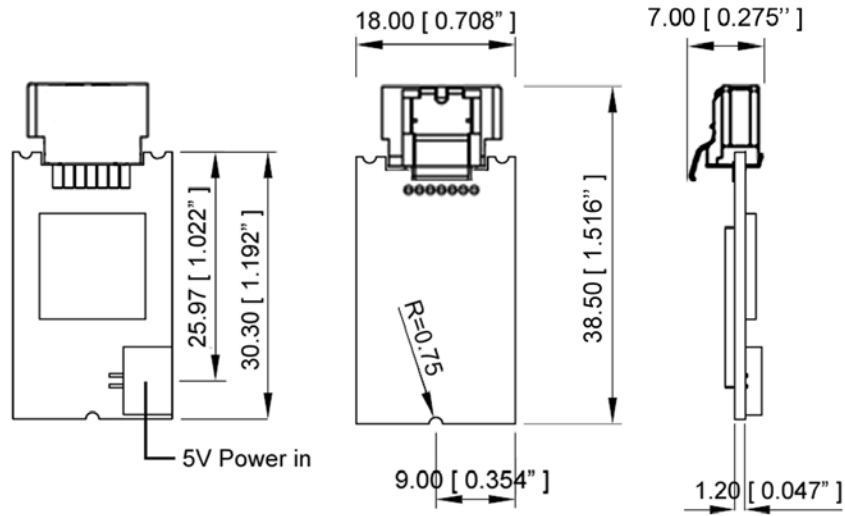
Vertical Type Standard Form Factor (VS)	Vertical Type Low Profile Form Factor (VL)	
Horizontal Type Standard Form Factor (HS)	Horizontal Type Low Profile Form Factor (HL)	Horizontal Type Low Profile Form Factor w/mounting hole (HO)

Refer to Table 6 & 7 for Micro SATA III Flash Module HERMES-G Series physical specifications and dimensions.

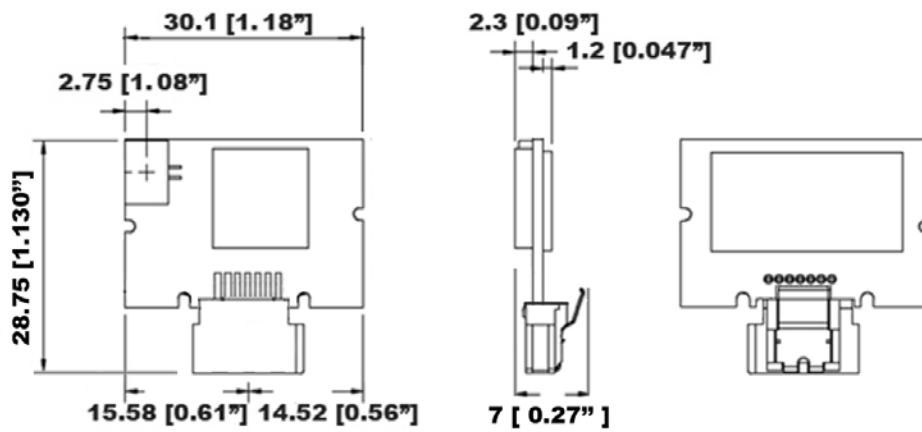
Table 7: Physical Specifications of APRO SLC Micro SATA III Flash Module-HERMES-G Series

Form-factor	Width	Length	Weight
Vertical Type – Standard (VS)	18.00 mm	38.50 mm	20.00g
Vertical Type – Low Profile (VL)	30.10 mm	28.75 mm	20.00g
Horizontal Type – Standard (HS)	18.00 mm	30.30 mm	20.00g
Horizontal Type –Low Profile (HL)	30.00 mm	20.08 mm	20.00g
Horizontal Type –Low Profile w/mounting hole (HO)	30.00 mm	28.8 mm	20.00g

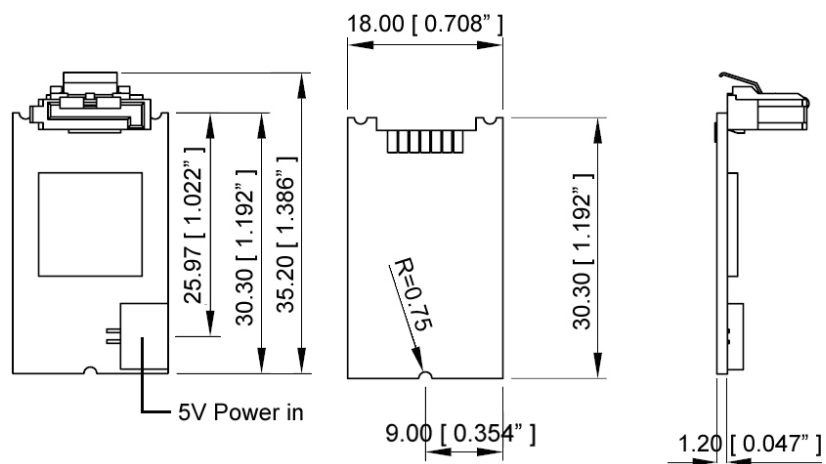
Vertical Type - Standard Form-factor (VS)



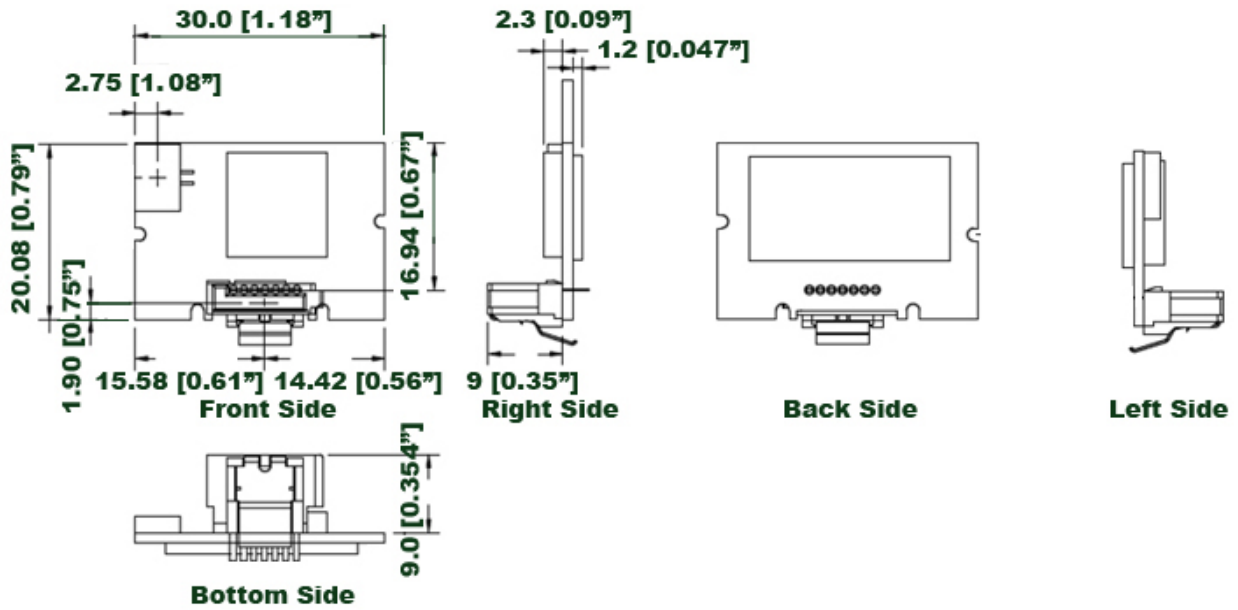
Vertical Type - Low Profile Form-factor (VL)



Horizontal Type - Standard Form-factor (HS)



Horizontal Type - Low Profile Form-factor (HL)



Horizontal Type - Low Profile Form-factor w/mounting hole (HO)

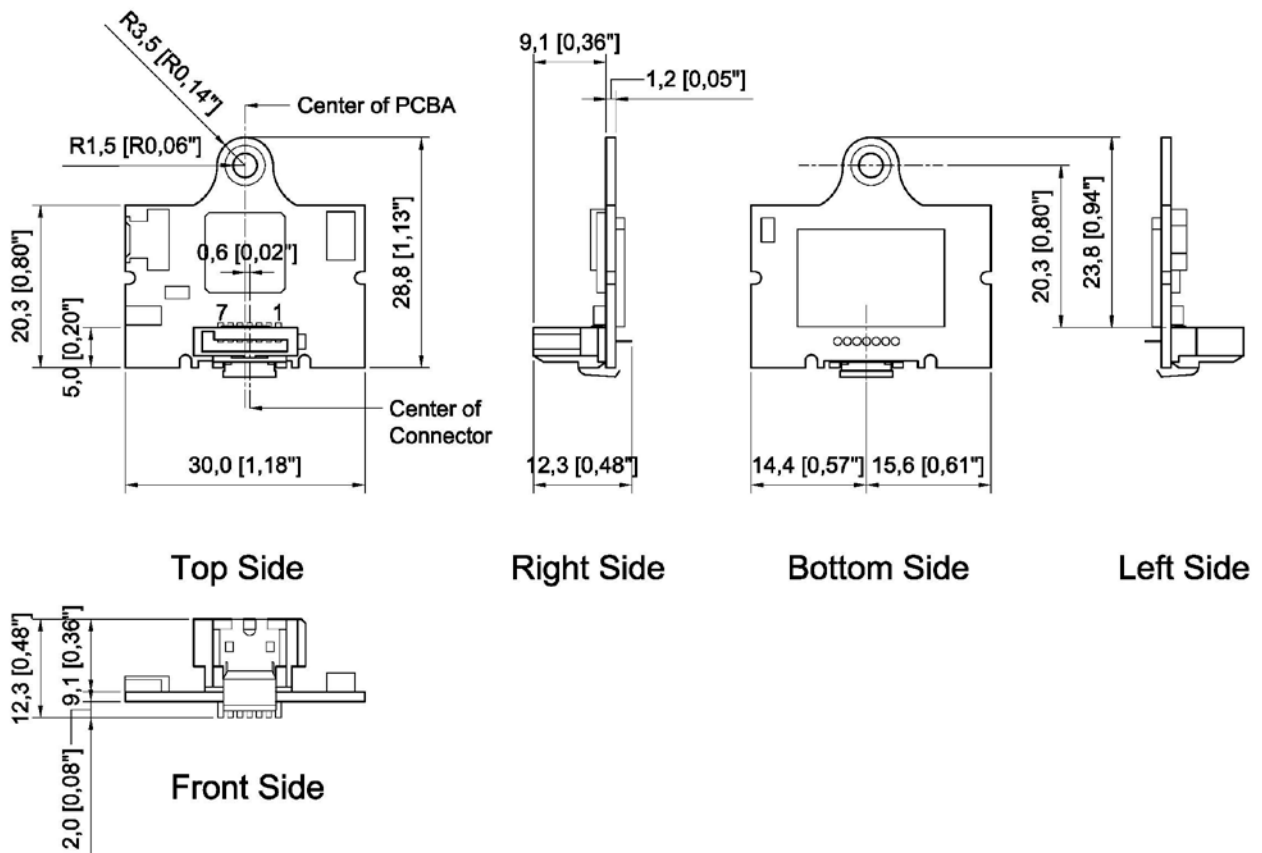


Figure 2: APRO SLC Micro SATA III Flash Module HERMES-G Series Dimension

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

2.6. Physical Description

APRO Industrial Micro SATA III Flash Modules – HERMES-G Series follow standard SATA 1.0a with 7-pin signal segment. The interface is 7-pin female connector. There are 2 solutions for customer’s requirement. If customer’s motherboard design in SATA interface pin-7 with 5V power output, there is a solution which has built-in power pin as the 7th pin of 7 pins header (w/fuse) , or another solution w/o fuse and for connection via cable.

Figure 4 is the aspect of the connector of micro SATA II Flash Module.

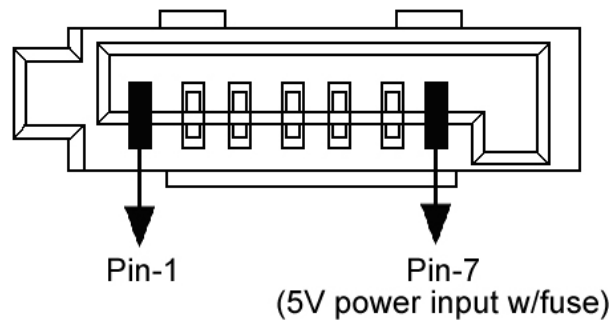


Figure 3: Front view of micro SATA III Flash Module HERMES-G Series

2.7. Pin Assignments

Refer to Table 9 for APRO Industrial Micro SATA III Flash Module – HERMES-G Series pin assignments. There are total of 7 pins in the signal segment.


Table 9 - Pin Assignments

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


Appendix A: Ordering Information

1. Part Number List


◆ APRO Industrial Micro SATA III Flash Module – Vertical Standard Form Factor

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Industrial Grade (-40°C ~ +85°C)
	1GB	SBMSF001G-JGCTC-VS(/F)	WBMSF001G-JGITI-VS(/F)
	2GB	SBMSF002G-JGCTC-VS(/F)	WBMSF002G-JGITI-VS(/F)
	4GB	SBMSF004G-JGCTC-VS(/F)	WBMSF004G-JGITI-VS(/F)
	8GB	SBMSF008G-JGCTC-VS(/F)	WBMSF008G-JGITI-VS(/F)
	16GB	SBMSF016G-JGCTC-VS(/F)	WBMSF016G-JGITI-VS(/F)
	32GB	SBMSF032G-JGCTC-VS(/F)	WBMSF032G-JGITI-VS(/F)


◆ APRO Industrial Micro SATA III Flash Module – Vertical Low Profile Form Factor

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Industrial Grade (-40°C ~ +85°C)
	1GB	SBMSF001G-JGCTC-VL(/F)	WBMSF001G-JGITI-VL(/F)
	2GB	SBMSF002G-JGCTC-VL(/F)	WBMSF002G-JGITI-VL(/F)
	4GB	SBMSF004G-JGCTC-VL(/F)	WBMSF004G-JGITI-VL(/F)
	8GB	SBMSF008G-JGCTC-VL(/F)	WBMSF008G-JGITI-VL(/F)
	16GB	SBMSF016G-JGCTC-VL(/F)	WBMSF016G-JGITI-VL(/F)
	32GB	SBMSF032G-JGCTC-VL(/F)	WBMSF032G-JGITI-VL(/F)


◆ APRO Industrial Micro SATA III Flash Module – Horizontal Standard Form Factor

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Industrial Grade (-40°C ~ +85°C)
	1GB	SBMSF001G-JGCTC-HS(/F)	WBMSF001G-JGITI-HS(/F)
	2GB	SBMSF002G-JGCTC-HS(/F)	WBMSF002G-JGITI-HS(/F)
	4GB	SBMSF004G-JGCTC-HS(/F)	WBMSF004G-JGITI-HS(/F)
	8GB	SBMSF008G-JGCTC-HS(/F)	WBMSF008G-JGITI-HS(/F)
	16GB	SBMSF016G-JGCTC-HS(/F)	WBMSF016G-JGITI-HS(/F)
	32GB	SBMSF032G-JGCTC-HS(/F)	WBMSF032G-JGITI-HS(/F)

◆ APRO MLC Micro SATA III Flash Module – Horizontal Low Profile Form Factor

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Wide Temp Grade (-40°C ~ +85°C)
	1GB	SBMSF001G-JGCTC-HL(/F)	WBMSF001G-JGITI-HL(/F)
	2GB	SBMSF002G-JGCTC-HL(/F)	WBMSF002G-JGITI-HL(/F)
	4GB	SBMSF004G-JGCTC-HL(/F)	WBMSF004G-JGITI-HL(/F)
	8GB	SBMSF008G-JGCTC-HL(/F)	WBMSF008G-JGITI-HL(/F)
	16GB	SBMSF016G-JGCTC-HL(/F)	WBMSF016G-JGITI-HL(/F)
	32GB	SBMSF032G-JGCTC-HL(/F)	WBMSF032G-JGITI-HL(/F)

◆ APRO MLC Micro SATA III Flash Module – Horizontal Low Profile w/mounting hole Form Factor

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Wide Temp Grade (-40°C ~ +85°C)
	1GB	SBMSF001G-JGCTC-HO(/F)	WBMSF001G-JGITI-HO(/F)
	2GB	SBMSF002G-JGCTC-HO(/F)	WBMSF002G-JGITI-HO(/F)
	4GB	SBMSF004G-JGCTC-HO(/F)	WBMSF004G-JGITI-HO(/F)
	8GB	SBMSF008G-JGCTC-HO(/F)	WBMSF008G-JGITI-HO(/F)
	16GB	SBMSF016G-JGCTC-HO(/F)	WBMSF016G-JGITI-HO(/F)
	32GB	SBMSF032G-JGCTC-HO(/F)	WBMSF032G-JGITI-HO(/F)

2. Part Number Decoder:

X1 X2 X3 X4 X5 X6 X7 X8 X9 – X11 X12 X13 X14 X15 – Y1 Y2 – C C

X1 : Grade

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

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

X2 : The material of case

B : Bare

X3 X4 X5 : Product category

MSF :Micro SATA Flash Module

X6 X7 X8 X9 : Capacity

001G:	1GB	008G:	8GB
002G:	2GB	016G:	16GB
004G:	4GB	032G:	32GB

X11 : Controller

J : JMicron 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

Y1 Y2 : MSF Orient Only

VS : Vertical Standard Form Factor

VL : Vertical Low Profile Form Factor

HS : Horizontal Standard Form Factor

HL : Horizontal Low Profile Form Factor

HO : Horizontal Low Profile w/mounting hole Form Factor

C : Reserved for specific requirement

F : Power Pin-7 with fuse

C : Conformal-coating

Appendix B: Limited Warranty

Appendix B: Limited Warranty

APRO warrants your Micro SATA III Flash Modules 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:

- SLC (Standard grade) 3 years / Within 60K Erasing Counts
- SLC (Industrial grade) 5 years / Within 60K Erasing Counts

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