



MLC  
MICRO SATA III  
FLASH MODULE  
HERMES-J Series

**Product Specification**

MLC MICRO SATA III FLASH MODULE

Version 01V1

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#### Revision History

Revision	Description	Date
1.0	Initial release	2016/5/03
1.1	Corrected <i>Table 7: Physical Specifications</i>	2017/02/21

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**1. Introduction**

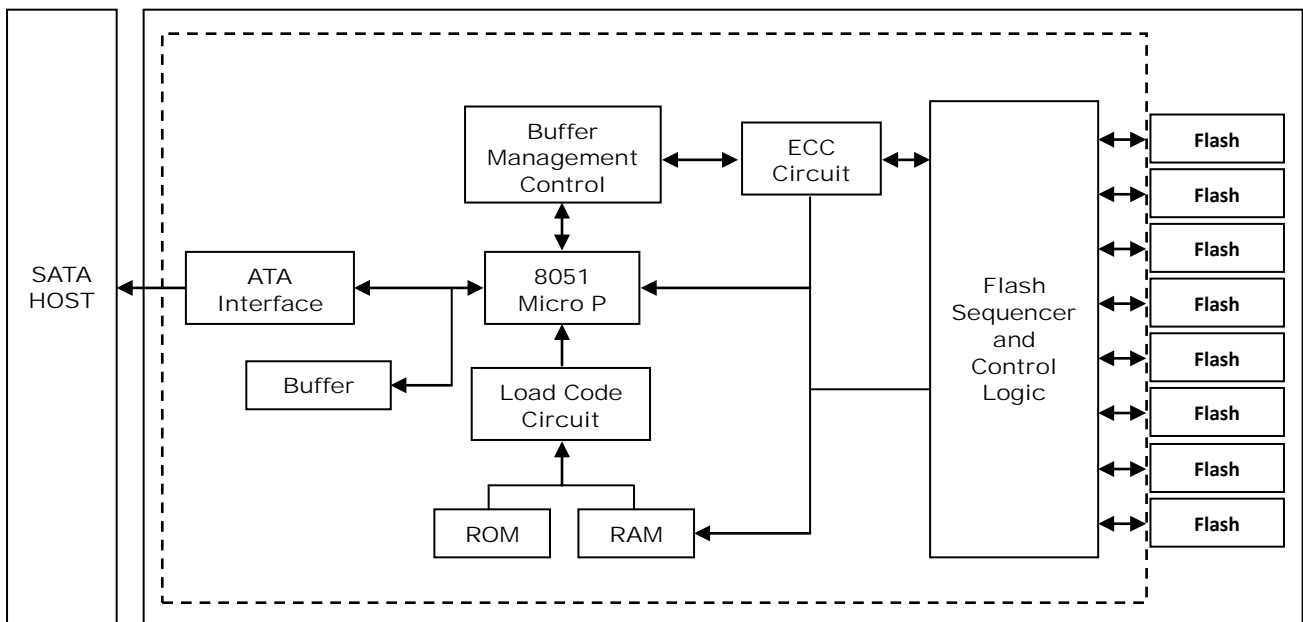
APRO MLC Micro SATA III Flash Module – HERMES-J Series provides high capacity flash memory Solid State Drive (SSD) that electrically complies with Serial ATA 3.0 (SATA) standard. APRO MLC Micro SATA III Flash Module – HERMES-J Series support SATA Gen-III (6.0 GB/s) with high performance. The main used flash memories are MLC-NAND type flash memory chips. The available disk capacities are 4GB, 8GB, 16GB, 32GB, 64GB and 128GB

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 210.0 MB/sec, and sequential write is up to 80.0 MB/sec.

APRO MLC 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 MLC 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 MLC Micro SATA III Flash Module HERMES-J 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 MLC 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 MLC Micro SATA III Flash Module controller.



**Figure 1: APRO MLC Micro SATA III Flash Module HERMES-J Series controller block diagram**

## 1.1. *Scope*

This document describes features, specifications and installation guide of APRO's MLC Micro SATA III Flash Module – HERMES-J 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 7 pins SATA female connector
- Particularly it is built-in power pin as the 7th pin of 7pin header (w/fuse) or power input power cable (w/o fuse).
- SATA 1.0a, SATA 2.6 and SATA 3.0 specification compliance
- 5-Form-factors support vertical and horizontal types
- S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology) function supported.
- Non-volatile memory and no moving parts
- Capacity from 4GB up to 128GB
- Sequential read performance up to 210.0 MB/sec
- Sequential write performance up to 80.0 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 wide temp grade with conformal coating supports -40°C to +85°C

## 1.3. *Flash Management Technology - Static Wear Leveling*

In order to gain the best management for flash memory, APRO MLC Micro SATA III Flash Module HERMES-J 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 MLC Micro SATA III Flash Module		Standard Grade	Wide Temp Grade
HERMES-J Series		SBMSFxxxG-JJCTMB	WBMSFxxxG-JJCTMB/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:	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 MLC Micro SATA III Flash Module		
HERMES-J Series		
DC Input Voltage (VCC)		5V±5%
+5V Current (Maximum average value)	Reading Mode :	110 (max.)
	Writing Mode :	125 (max.)
	Idle Mode :	90 (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	4GB	8GB	16GB	32GB	64GB	128GB
	Sequential Read (MB/s)	100.0	100.0	100.0	100.0	210.0	210.0
	Sequential Write(MB/s)	20.0	20.0	20.0	40.0	75.0	80.0
	4KB Random Read IOPS (QD32)	3.8K	3.8K	4.0K	4.2K	7.1K	7.1K
	4KB Random Write IOPS (QD32)	4.8K	4.8K	5.3K	9.7K	13.3K	13.3K

Note:

- (1). All values quoted are typically at 25 °C and nominal supply voltage.
- (2). Testing of the MLC Micro SATA III Flash Module maximum performance was performed under the following platform:
  - CrystalDiskMark 3.01 with file size 1000MB test patent
  - Windows 7 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; <b>3K Erase Counts (P/E Cycles)</b>	
<b>TBW (Tera Bytes Written)</b>		
Capacity	<b>TBW(TB)</b>	<b>DWPD &amp; Lifespan</b>
4GB	1.16	DWPD=0.407 DWPD ( Drive Written Per Day ) Lifespan = 2 Years
8GB	2.32	
16GB	4.64	
32GB	9.28	
64GB	18.56	
128GB	37.12	

Note:

- (1). Written Specification which is based on JEDEC 218 (Solid-State Drive Requirements and Endurance Test Method).
- (2). Lifespan is calculated by device written per day

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)

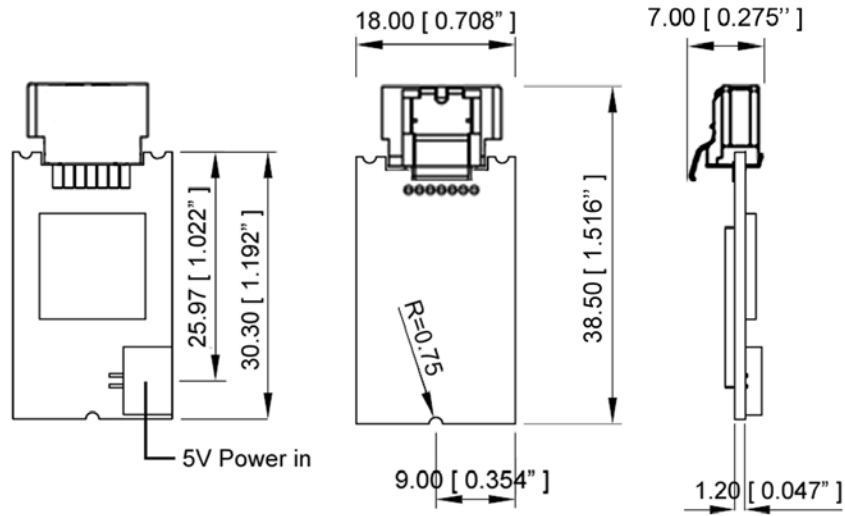
Refer to Table 6 & 7 for Micro SATA III Flash Module HERMES-J Series physical specifications and dimensions.

Table 7: Physical Specifications of APRO MLC Micro SATA III Flash Module-HERMES-J Series

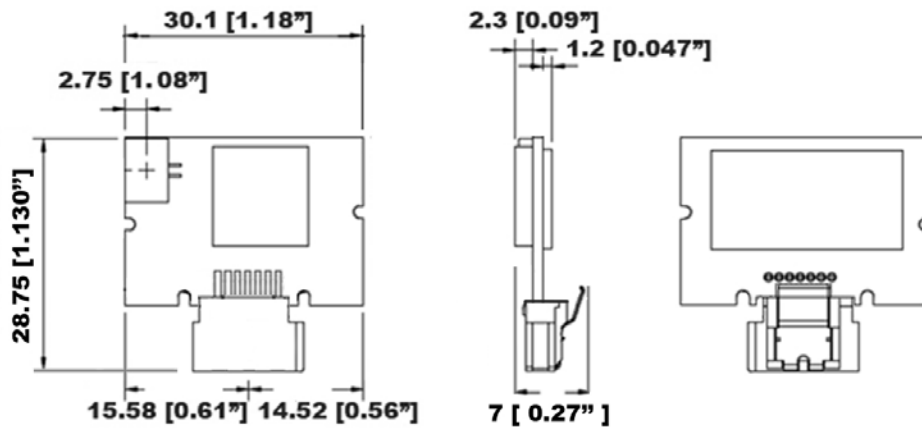
Form-factor	Width	Length	Weight
Vertical Type – Standard (VS)	18.00 mm	38.50 mm	20.00g
Vertical Type – Low Profile (VL)	30.10 mm	28.75 mm	20.00g
Horizontal Type – Standard (HS)	18.00 mm	30.30 mm	20.00g
Horizontal Type –Low Profile (HL)	30.00 mm	20.08 mm	20.00g
Horizontal Type –Low Profile w/mounting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



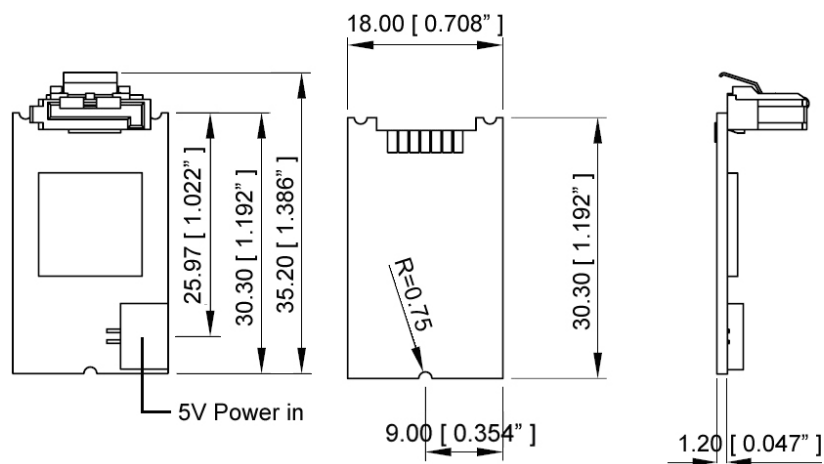
**Vertical Type - Standard Form-factor (VS)**



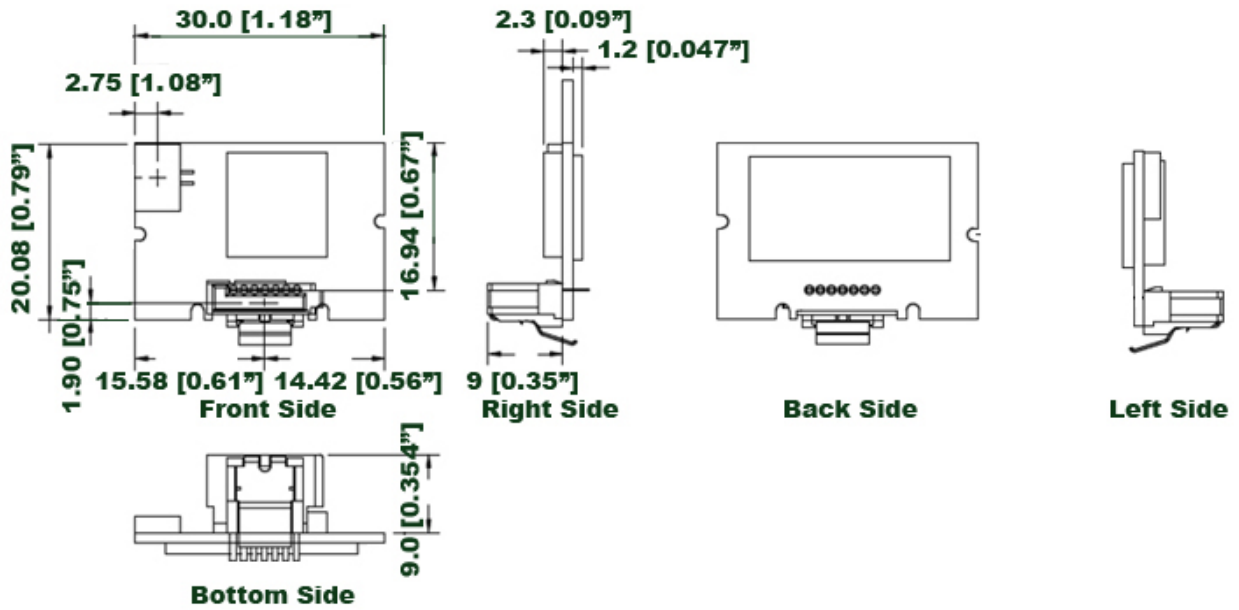
**Vertical Type - Low Profile Form-factor (VL)**



**Horizontal Type - Standard Form-factor (HS)**



Horizontal Type - Low Profile Form-factor (HL)



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

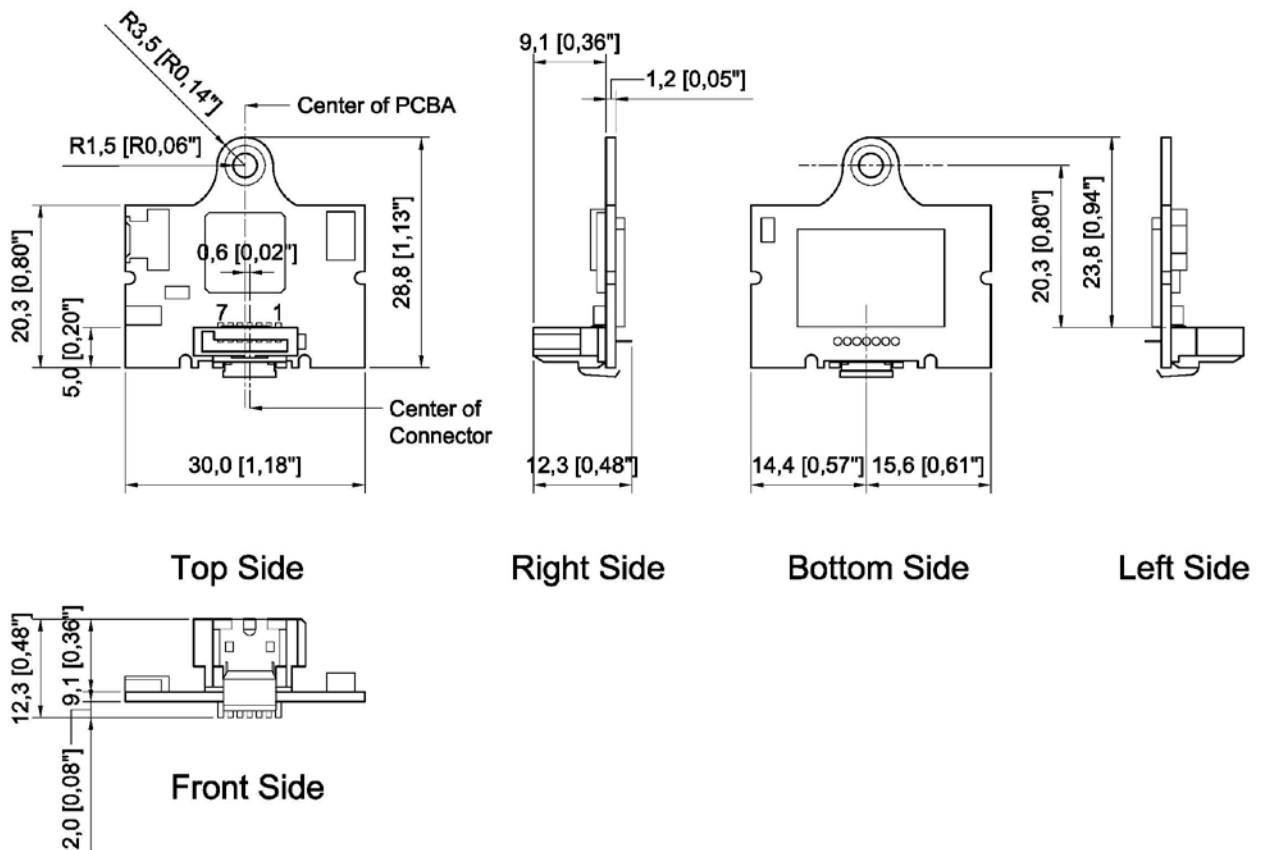


Figure 2: APRO MLC Micro SATA III Flash Module HERMES-J Series Dimension

### **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 request 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 MLC Micro SATA III Flash Modules – HERMES-J 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 3 is the aspect of the connector of micro SATA II Flash Module.

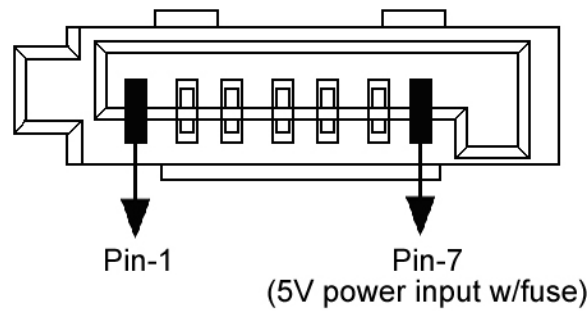


Figure 3: Front view of micro SATA III Flash Module HERMES-J Series

## 2.7. Pin Assignments

Refer to Table 8 for APRO MLC Micro SATA III Flash Module – HERMES-J Series pin assignments. There are total of 7 pins in the signal segment.


Table 8 - 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 MLC Micro SATA III Flash Module – Vertical Standard Form Factor

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Wide Temp Grade ( -40°C ~ +85°C )
	4GB	SBMSF004G-JJCTMB-VS(-F)	WBMSF004G-JJCTMB -VS(-F)/C
	8GB	SBMSF008G-JJCTMB-VS(-F)	WBMSF008G-JJCTMB -VS(-F)/C
	16GB	SBMSF016G-JJCTMB-VS(-F)	WBMSF016G-JJCTMB -VS(-F)/C
	32GB	SBMSF032G-JJCTMB-VS(-F)	WBMSF032G-JJCTMB -VS(-F)/C
	64GB	SBMSF064G-JJCTMB-VS(-F)	WBMSF064G-JJCTMB -VS(-F)/C
	128GB	SBMSF128G-JJCTMB-VS(-F)	WBMSF128G-JJCTMB -VS(-F)/C


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

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Wide Temp Grade ( -40°C ~ +85°C )
	4GB	SBMSF004G-JJCTMB-VL(-F)	WBMSF004G-JJCTMB-VL(-F)/C
	8GB	SBMSF008G-JJCTMB-VL(-F)	WBMSF008G-JJCTMB-VL(-F)/C
	16GB	SBMSF016G-JJCTMB-VL(-F)	WBMSF016G-JJCTMB-VL(-F)/C
	32GB	SBMSF032G-JJCTMB-VL(-F)	WBMSF032G-JJCTMB-VL(-F)/C
	64GB	SBMSF064G-JJCTMB-VL(-F)	WBMSF064G-JJCTMB-VL(-F)/C
	128GB	SBMSF128G-JJCTMB-VL(-F)	WBMSF128G-JJCTMB-VL(-F)/C


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

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Wide Temp Grade ( -40°C ~ +85°C )
	4GB	SBMSF004G-JJCTMB-HS(-F)	WBMSF004G-JJCTMB-HS(-F)/C
	8GB	SBMSF008G-JJCTMB-HS(-F)	WBMSF008G-JJCTMB-HS(-F)/C
	16GB	SBMSF016G-JJCTMB-HS(-F)	WBMSF016G-JJCTMB-HS(-F)/C
	32GB	SBMSF032G-JJCTMB-HS(-F)	WBMSF032G-JJCTMB-HS(-F)/C
	64GB	SBMSF064G-JJCTMB-HS(-F)	WBMSF064G-JJCTMB-HS(-F)/C
	128GB	SBMSF128G-JJCTMB-HS(-F)	WBMSF128G-JJCTMB-HS(-F)/C

◆ 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 )
	4GB	SBMSF004G-JJCTMB-HL(-F)	WBMSF004G-JJCTMB-HL(-F)/C
	8GB	SBMSF008G-JJCTMB-HL(-F)	WBMSF008G-JJCTMB-HL(-F)/C
	16GB	SBMSF016G-JJCTMB-HL(-F)	WBMSF016G-JJCTMB-HL(-F)/C
	32GB	SBMSF032G-JJCTMB-HL(-F)	WBMSF032G-JJCTMB-HL(-F)/C
	64GB	SBMSF064G-JJCTMB-HL(-F)	WBMSF064G-JJCTMB-HL(-F)/C
	128GB	SBMSF128G-JJCTMB-HL(-F)	WBMSF128G-JJCTMB-HL(-F)/C

◆ 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 )
	4GB	SBMSF004G-JJCTMB-HO(-F)	WBMSF004G-JJCTMB-HO(-F)/C
	8GB	SBMSF008G-JJCTMB-HO(-F)	WBMSF008G-JJCTMB-HO(-F)/C
	16GB	SBMSF016G-JJCTMB-HO(-F)	WBMSF016G-JJCTMB-HO(-F)/C
	32GB	SBMSF032G-JJCTMB-HO(-F)	WBMSF032G-JJCTMB-HO(-F)/C
	64GB	SBMSF064G-JJCTMB-HO(-F)	WBMSF064G-JJCTMB-HO(-F)/C
	128GB	SBMSF128G-JJCTMB-HO(-F)	WBMSF128G-JJCTMB-HO(-F)/C

### 2. Part Number Decoder:

**X1 X2 X3 X4 X5 X6 X7 X8 X9** — **X11 X12 X13 X14 X15 X16** — **Y1 Y2** — **C C**

**X1** : Grade

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

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

(with conformal coating on PCBA)

**X2** : The material of case

**B** : Bare

**X3 X4 X5** : Product category

**MSF** :Micro 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	<b>128G</b>	128GB

**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** : Generation

**B** : 15nm

**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***

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:***

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

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