



SATA III MLC CFast Card

HERMES-J Series

Product Specification

APRO SATA III MLC CFast Card

Version 01V0

Document No. 100-xXCFA-JJCTMB

March 2016

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Revision History

Revision	Description	Date
1.0	Initial release	2016/3/16

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1. Introduction

APRO provides high capacity flash memory of SATA III MLC CFast Card – HERMES-J Series that complies with Serial ATA 3.0 (SATA) standard. APRO SATA III MLC CFast Card – HERMES-J Series support SATA Gen-III (6.0 GB/s) with high performance. The data transfer performance by sequential read is up to 220 MB/sec, and sequential write is up to 130 MB/sec.

It is also complies with CFast 2.0 standard, and designed with 7+17 pin connector. The main used flash memories are MLC-NAND type flash memory chips. The available disk capacities are 4GB, 8GB, 16GB, 32GB, 64GB, 128GB and 256GB.

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.

APRO SATA III MLC CFast Card – HERMES-J Series 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 used high tech SATA III MLC CFast Card controller.

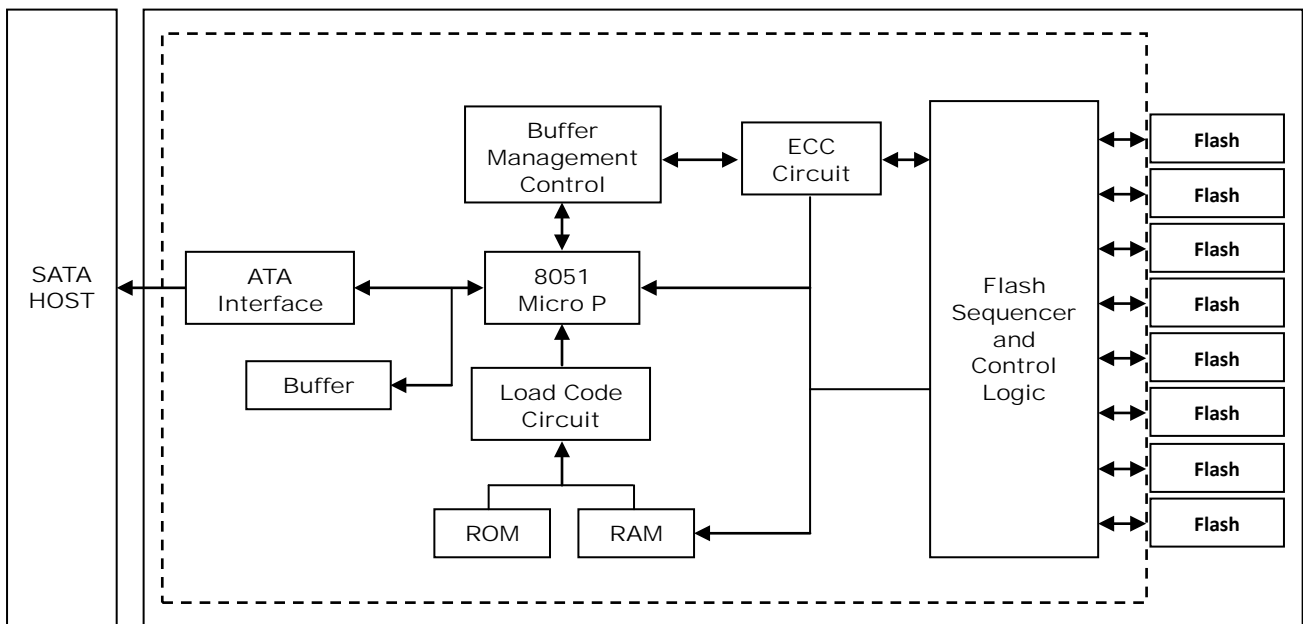


Figure 1: APRO SATA III MLC CFast Card HERMES-J Series controller block diagram

1.1. Scope

This document describes features, specifications and installation guide of APRO's SATA III MLC CFast Cards – 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
- Compliant with CFast™ specification V2.0
- 7-pin (data) + 17-pin (power) CFast Card connector
- CFast Type I form-factor
- SATA 1.0a, SATA 2.6 and SATA 3.0 specification compliance
- S.M.A.R.T (Self-Monitoring, Analysis and Reporting Technology) function supported.
- Non-volatile memory and no moving parts
- MLC CFast card capacity from 4GB up to 256GB
- Sequential read performance up to 220 MB/sec
- Sequential write performance up to 130 MB/sec
- Automatic 40 bits per 1024 bytes error correction (ECC) and retry capabilities
- +3.3V ±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, -40°C to +85°C with special conformal coating treatment on PCBA

1.3. Flash Management Technology - Static Wear Leveling

Flash memory can be programmed and erased within a limited number of times, and the limited of the P/E cycle is defined by the flash array vendor. The P/E cycle limited applies to each individual erase block in the flash device.

In order to gain the best management for flash memory, APRO SATA III MLC CFast Card 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. Capacity Specifications

Table 1: Device Parameters

Unformatted Capacity	Cylinder	Head	Sector	LBA
4GB	7,762	16	63	7,824,096
8GB	15,525	16	63	15,649,200
16GB	16,383	16	63	31,277,232
32GB	16,383	16	63	62,533,296
64GB	16,383	16	63	125,045,424
128GB	16,383	16	63	250,069,680
256GB	16,383	16	63	500,118,192

2.2. System Environmental Specifications

Table 2: Environmental Specification

APRO SATA III MLC CFast Card		Standard Grade	Wide Temp Grade
HERMES-J Series		SxCFAxxxG-JJCTMB	WxCFAxxxG-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	

2.3. System Power Requirements

Table 3: Power Requirement

APRO SATA III MLC CFast Card		
HERMES-J Series		
DC Input Voltage.		3.3V±5%
+3.3V Current (Maximum average value)	Reading Mode :	220 (max.)
	Writing Mode :	320 (max.)
	Idle Mode :	50 (max.)

2.4. System Performance

Table 4: 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
	Sequential Read (MB/s)	TBC	100	100	200	220	220	220
	Sequential Write(MB/s)	TBC	20	20	40	80	130	130
	4KB Random Read IOPS (QD32)	TBC	4.0K	4.0K	6.1K	6.9K	7.8K	8.3K
	4KB Random Write IOPS (QD32)	TBC	5.9K	5.9K	8.6K	15.4K	21.8K	21.8K
The number of Flash IC		1pc	2pcs	2pcs	2pcs	4pcs	4pcs	4pcs

Note:

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

(2). Testing of the SATA III MLC CFast Card maximum performance was performed under the following platform:

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

2.5. System Reliability

Table 5: System Reliability

Wear-leveling Algorithms	Static Wear-leveling	
Bad Blocks Management	Supportive	
ECC Technology	40 bits per 1024 bytes	
Thermal Sensor	Supportive	
Endurance	TBW (Tera Bytes Written) ; Based on Sequential Write Test.	
Capacity	TBW(TB)	DWPD & Lifespan
4GB	10.8	DWPD=3.79 DWPD (Drive Written Per Day) Lifespan = 2 Years
8GB	21.6	
16GB	43.2	
32GB	86.4	
64GB	172.8	
128GB	345.6	
256GB	691.2	

2.6. Physical Specifications

Refer to Table 6 and see Figure 2 for SATA III MLC CFast Card HERMES-J Series physical specifications and dimensions.

Table 6: Physical Specifications

Length:	42.8 + 0.10mm / 1.69 in
Width:	36.4 + 0.15mm / 1.43 in
Thickness:	3.5 (3.6 max) + 0.1mm / 0.13 in (Based on CFast 1.0 Specification, the max. thickness is 3.6mm.)

Weight:	Plastic: 10g / 0.4oz ; Metal: 13g / 0.46oz
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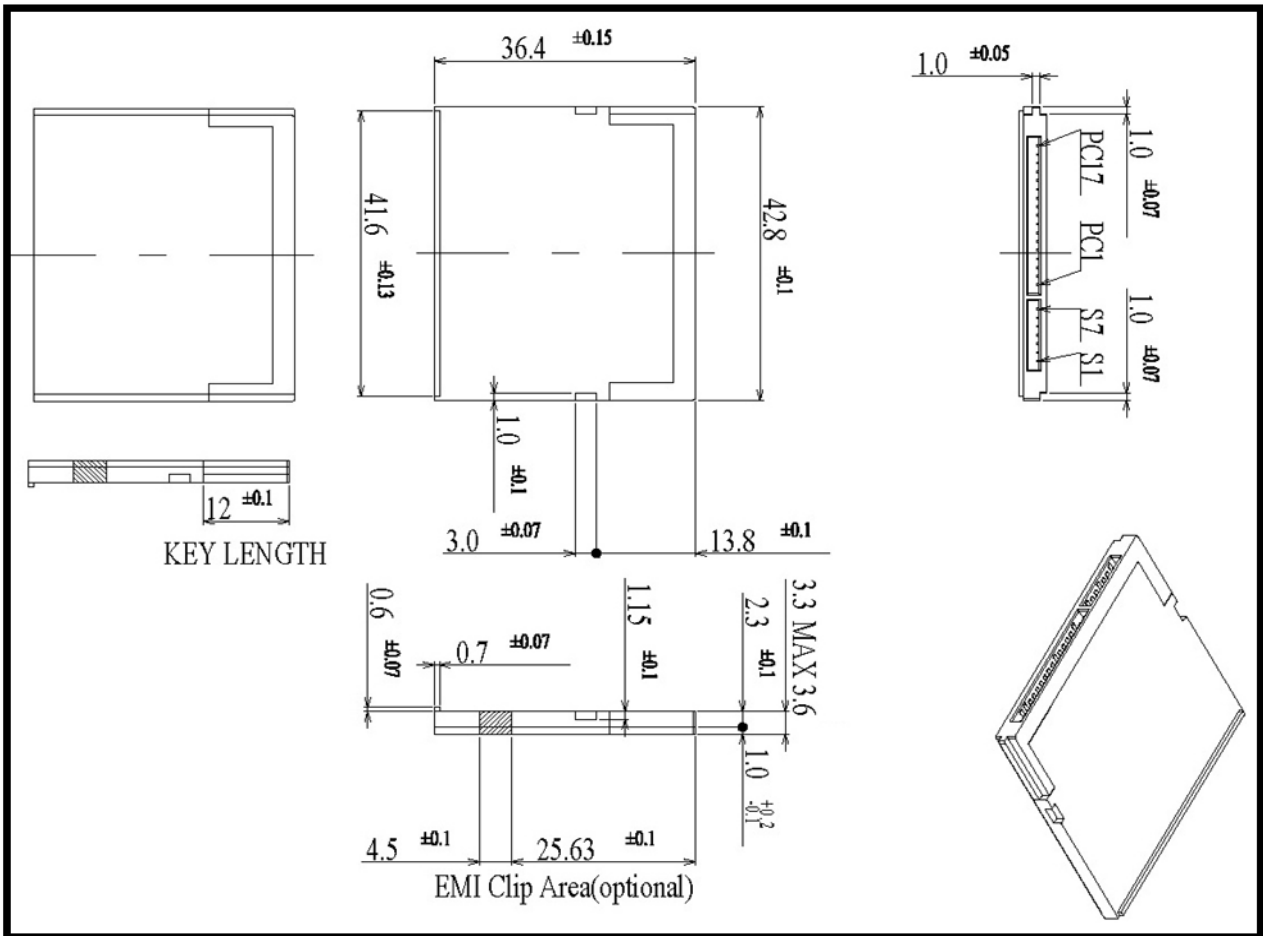


Figure 2: APRO SATA III MLC CFast Card Dimension

2.6.1. 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 CFast Card interface

APRO CFast Card is equipped with 7 pins in the signal segment and 17 pins in the power segment.



Figure 3: SATA 7-pin (data) + 17-pin (power)

3.2. Pin Assignments

Refer to Table 7 and see Figure 3 for APRO SATA III MLC CFast Card – HERMES-J Series pin assignments. There are total of 7 pins in the signal segment and 17 pins in the power segment. The pin assignments are listed in below table 7.

Table 7: Pin Assignments

Name	Type	Description
A1	GND	NA
A2	A+	Differential Signal Pair A
A3	A-	
A4	GND	NA
A5	B-	Differential Signal Pair B
A6	B+	
A7	GND	NA

Key and Spacing separate signal and power segments		
P1	CDI	Card Detect In
P2	PGND	Device Ground
P3	DEVSLP	Device Sleep
P4	NA	Reserved
P5	NA	Reserved
P6	NA	Reserved
P7	PGND	Device Ground
P8	LED1	LED Output
P9	LED2	LED Output
P10	NA	Reserved
P11	NA	Reserved
P12	IFDET	NA
P13	PWR	Device Power
P14	PWR	Device Power
P15	PGND	Device Ground

Key and Spacing separate signal and power segments		
P16	PGND	Device Ground
P17	CDO	Card Detect Out

4. S.M.A.R.T.

Individual SMART commands are identified by the value placed in the Feature register.

Table 8: S.M.A.R.T. Command

Value	Command	Value	Command
D0h	SMART Read Data	D5h	Read Log
D1h	Read Attribute Threshold	D6h	SMART Return Status
D2h	SMART Enable/Disable Attribute Auto save	D8h	Enable SMART Operations
D3h	Save Attribute Values	D9h	Disable SMART Operations
D4h	Execute OFF-LINE Immediate	DAh	Return Status

4.1. S.M.A.R.T. Attributes


Table 9: S.M.A.R.T. Attribute

Attribute ID (HEX)	Attribute Command
01	Read Error Rate
05	Later Bad
09	Power-On hours Count
0C	Drive Power Cycle Count
A3	Total Bad Block Count
A5	Max Erase count
A7	Avg. Erase count
A9	Device Life
AA	Spare Block Count
AB	Program fail count
AC	Erase fail count
C0	Unexpected Power Loss Count
C2	Temperature
E5	Flash ID
EB	Later Bad Block
F1	Total LBAs written (each write unit = 32MB)
F2	Total LBAs read (each write unit = 32MB)


Appendix A: Ordering Information

1. Part Number List

◆ **APRO SATA III MLC CFast Card – HERMES-J Series with Plastic frame Kit**

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Wide Temp. Grade (-40°C ~ +85°C)
	4GB	SPCFA004G-JJCTMB	WPCFA004G-JJCTMB-C
	8GB	SPCFA008G-JJCTMB	WPCFA008G-JJCTMB-C
	16GB	SPCFA016G-JJCTMB	WPCFA016G-JJCTMB-C
	32GB	SPCFA032G-JJCTMB	WPCFA032G-JJCTMB-C
	64GB	SPCFA064G-JJCTMB	WPCFA064G-JJCTMB-C
	128GB	SPCFA128G-JJCTMB	WPCFA128G-JJCTMB-C
	256GB	SPCFA256G-JJCTMB	WPCFA256G-JJCTMB-C

◆ **APRO SATA III MLC CFast Card – HERMES-J Series with Rugged Metal frame Kit**

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Wide Temp. Grade (-40°C ~ +85°C)
	4GB	SRCFA004G-JJCTMB	WRCFA004G-JJCTMB-C
	8GB	SPCFA008G-JJCTMB	WPCFA008G-JJCTMB-C
	16GB	SRCFA016G-JJCTMB	WRCFA016G-JJCTMB-C
	32GB	SRCFA032G-JJCTMB	WRCFA032G-JJCTMB-C
	64GB	SRCFA064G-JJCTMB	WRCFA064G-JJCTMB-C
	128GB	SRCFA128G-JJCTMB	WRCFA128G-JJCTMB-C
	256GB	SRCFA256G-JJCTMB	WRCFA256G-JJCTMB-C

Notes:

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

◆ Part Number Decoder:



X1 : Grade

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

W: Wide Temp Grade- operating temp. -40° C ~ +85 ° C
(With Conformal Coating treatment on PCBA)

X2 : The material of case

P : Plastic frame kit

R : Rugged Metal frame kit

X3 X4 X5 : Product category

CFA : CFast card

X6 X7 X8 X9 : Capacity

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

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 : 15 nm

C : Reserved for specific requirement

C : Conformal-coating

Appendix B: Limited Warranty

APRO warrants your SATA III MLC CFast Card 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.