



# SATA III

# MLC CFast Card

## PHANES-C Series

### **Product Specification**

APRO MLC SATA III CFast Card

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#### Revision History

Revision	Description	Date
1.0	Initial Released	2016 / 04 / 11

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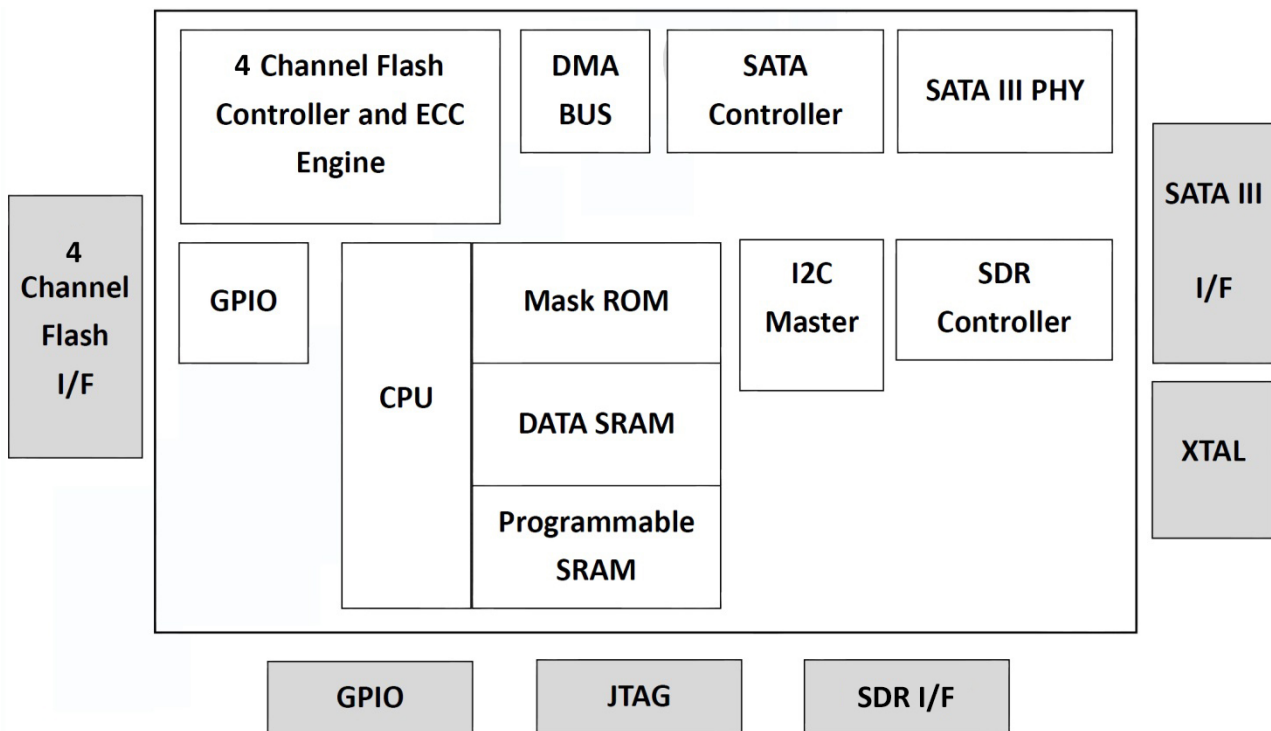
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**1. Introduction**

APRO MLC CFast Card PHANES-C Series compliant to the CFast™ Specification 2.0 issued by CompactFlash Association (CFA), it breakthroughs the speed performance under traditional ATA/ATAPI specification. Integrating the CompactFlash card form factor and Serial ATA (SATA I/ II/ III) interface, the transfer speed is much higher than traditional CF Card while it keeps small form factor and rigid case as CF Card. The PHANES-C Series CFast Card also supports Metal Frame Kit as an optional product which may endure various harsh operating environments. The main used Flash memory is MLC-NAND Type Flash memory chips from 8GB up to 128GB. APRO MLC CFast Card PHANES-C Series features with great portability and resistance against vibration. The sequential read speed is 450 MB/sec and sequential write speed is 180 MB/sec for Multiple Level Cell (MLC) solution. Furthermore, APRO also provide 1.8" SATA to CFast card Adapter (P/N: AD-CA128SATA200AR ) to increase the application flexibility.

APRO's MLC CFast Card supports optional standard grade operating temperature 0°C ~ 70°C and wide temperature -40°C ~ +85°C.

APRO MLC CFast Card PHANES-C Series is suitable to handheld device embedded system, inventory recorder and particularly for serious environment monitor recorder system. Also, through APRO 1.8" SATA to CFast card Adapter, APRO MLC CFast Card PHANES-C Series can be high speed booting SSD to varieties of IPC motherboards and PC structure system. Figure 1 shows a block diagram of the used high tech CFast Card controller.



**Figure 1: APRO SATA III CFast Card PHANES-C Series controller block diagram**

## 1.1. *Scope*

This document describes features, specifications and installation guide of APRO's MLC SATA III CFast Card – PHANES-C 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
- CFast Type I form-factor
- 7-pin (data) + 17-pin (power) CFast Card connector
- 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
- Capacity from 8GB up to 128GB
- Sequential read performance up to 450 MB/sec
- Sequential write performance up to 180 MB/sec
- Automatic 72 bits per 1024 bytes error correction (ECC) and retry capabilities
- +3.3V  $\pm 5\%$  operation
- Shock : 0.5ms, 1500 G, 3 axes
- Vibration : 20 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, -40°C to +85°C

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

NAND flash devices can only undergo a limited number of program/erase cycles, and in most cases, the flash media are not used evenly. If some areas get updated more frequently than others, the lifetime of the device would be reduced significantly. Thus, Wear Leveling is applied to extend the lifespan of NAND Flash by evenly distributing write and erase cycles across the media.

APRO MLC CFast Card PHANES-C Series provides advanced Wear Leveling algorithm, which can efficiently spread out the flash usage through the whole flash media area. Moreover, by implementing both dynamic and static Wear Leveling algorithms, the life expectancy of the NAND flash is greatly improved.

## 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**

PHANES-C Series MLC SATA III CFast Card		Standard Grade	Wide Temp Grade
		SPCFAxxxG-PCCTMB SRCFAxxxG-PCCTMB	WPCFAxxxG-PCCTMB/C WRCFAxxxG-PCCTMB/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:	20 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 SATA III CFast Card PHANES-C Series		
DC Input Voltage (VCC) 100mV max. ripple(p-p)		3.3V±5%
+3.3V Current (Maximum average value)	Reading Mode :	935 mW (max.)
	Writing Mode :	955 mW (max.)
	Idle Mode :	4.9 mW (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	8GB	16GB	32GB	64GB	128GB
	Sequential Read (MB/s)	125	125	245	230	450
	Sequential Write(MB/s)	80	80	145	160	180

Note:

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

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

- Computer with Intel i5 3.5GHz processor with Windows 7 Professional operating system

## 2.4. System Reliability

**Table 4: System Reliability**

<b>Wear-leveling Algorithms</b>	Static and Dynamic Wear-leveling	
<b>Bad Blocks Management</b>	Supportive	
<b>ECC Technology</b>	72 bits per 1024 bytes	
<b>Endurance</b>	TBW (Tera Bytes Written) ; Based on Sequential Write Test.	
<b>Capacity</b>	<b>TBW(TB)</b>	<b>DWPD &amp; Lifespan</b>
<b>8GB</b>	20	DWPD=3.51 DWPD ( Drive Written Per Day ) Lifespan = 2 Years
<b>16GB</b>	39	
<b>32GB</b>	80	
<b>64GB</b>	159	
<b>128GB</b>	318	

## 2.5. Physical Specifications

Refer to Table 5 and see Figure 2 for APRO MLC Cfast Card – PHANES-C Series physical dimensions.

**Table 5: Physical Specifications of MLC Cfast Card-PHANES-C Series**

<b>Length:</b>	42.8 + 0.10mm / 1.69 in
<b>Width:</b>	36.4 + 0.15mm / 1.43 in
<b>Thickness:</b>	3.5 (3.6 max) + 0.1mm / 0.13 in (Based on Cfast 1.0 Specification, the max. thickness is 3.6mm.)
<b>Weight:</b>	Plastic: 10g / 0.4oz ; Metal: 13g / 0.46oz

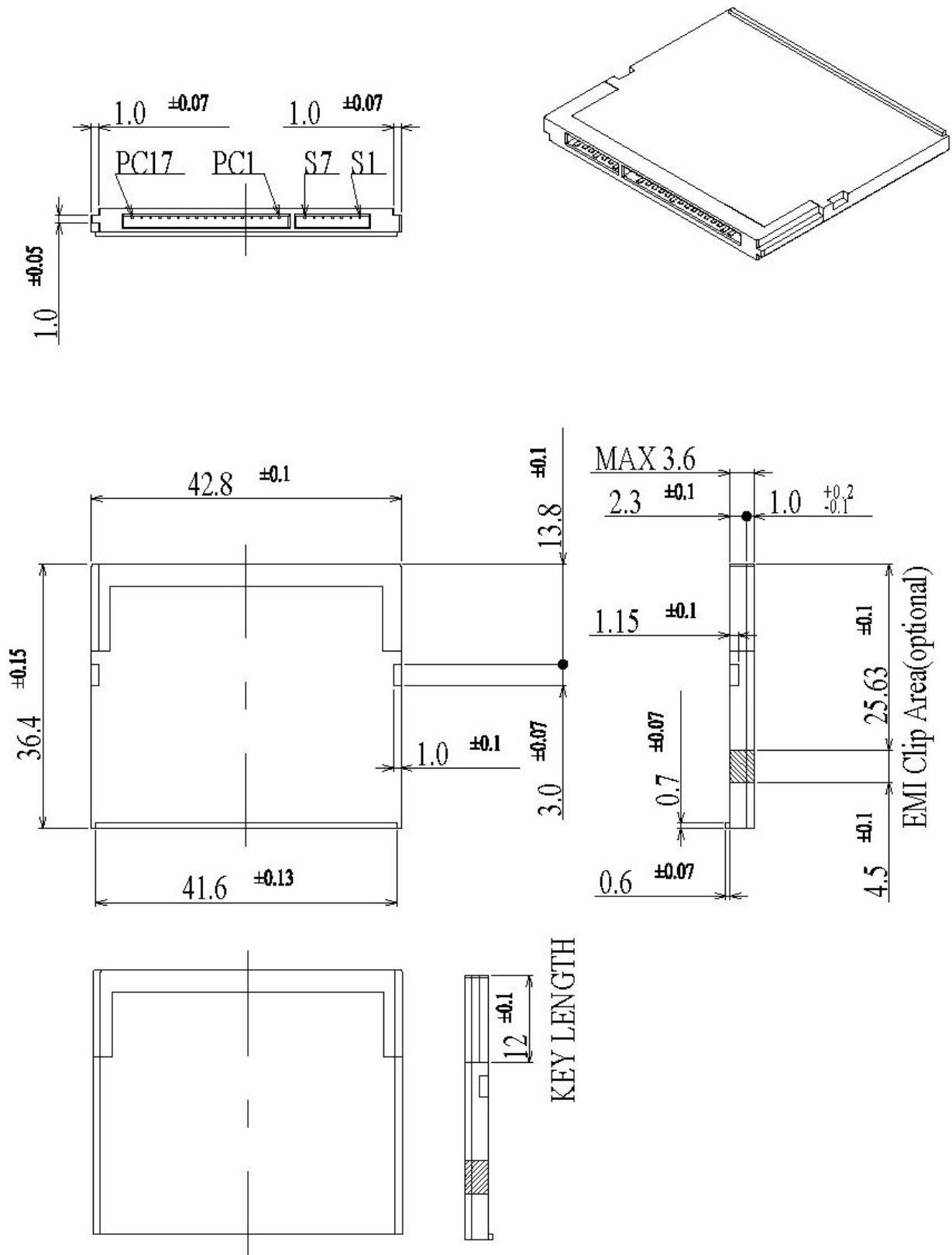


Figure 2: APRO MLC SATA III CFast Card Dimension



**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 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 MLC CFast Card – PHANES-C 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
S1	GND	NA
S2	A+	Differential Signal Pair A
S3	A-	
S4	GND	NA
S5	B-	Differential Signal Pair B
S6	B+	
S7	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
P16	PGND	Device Ground
P17	CDO	Card Detect Out


**Appendix A: Ordering Information**

**1. Part Number List**

◆ **APRO MLC SATA III CFast Card – PHANES-C Series with Plastic frame Kit**

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Wide Temp Grade ( -40°C ~ +85°C )
	8GB	SPCFA008G-PCCTMB	WPCFA008G-PCCTMB/C
	16GB	SPCFA016G-PCCTMB	WPCFA016G-PCCTMB/C
	32GB	SPCFA032G-PCCTMB	WPCFA032G-PCCTMB/C
	64GB	SPCFA064G-PCCTMB	WPCFA064G-PCCTMB/C
	128GB	SPCFA128G-PCCTMB	WPCFA128G-PCCTMB/C

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

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Wide Temp Grade ( -40°C ~ +85°C )
	8GB	SRCFA008G-PCCTMB	WRCFA008G-PCCTMB/C
	16GB	SRCFA016G-PCCTMB	WRCFA016G-PCCTMB/C
	32GB	SRCFA032G-PCCTMB	WRCFA032G-PCCTMB/C
	64GB	SRCFA064G-PCCTMB	WRCFA064G-PCCTMB/C
	128GB	SRCFA128G-PCCTMB	WRCFA128G-PCCTMB/C

**2. 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

008G: 8GB

016G: 16GB

032G: 32GB

064G: 64GB

128G: 128GB

**X11** : Controller

P : PHANES 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** : Flash IC

B : 15 nm

**C** : Reserved for specific requirement

C : Conformal-coating

### ***Appendix B: Limited Warranty***

APRO warrants your SATA III CFast Cards 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.***