SATA III SLC CFAST CARD

HERMES-I Series

Product Specification

INDUSTRIAL

APRO INDUSTRIAL SATA III CFAST CARD

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Revision History

Revision	Description	Date
1.0	Initial release	2018/5/15

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    APRO Industrial SATA III CFast Card – HERMES-I Series © 2018 APRO Co., Ltd.

1.   Introduction

APRO Industrial SATA III CFast Card – HERMES-I Series provides high capacity flash memory Solid State Drive (SSD) that electrically complies with Serial ATA 3.0 (SATA) standard. APRO Industrial SATA III CFast Card – HERMES-I 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 of HERMES-I Series.

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 330.0 MB/sec, and sequential write is up to 190.0 MB/sec; The random read of 4KB data is up to 11.5K and the random write is up to 14.2K (QD32).

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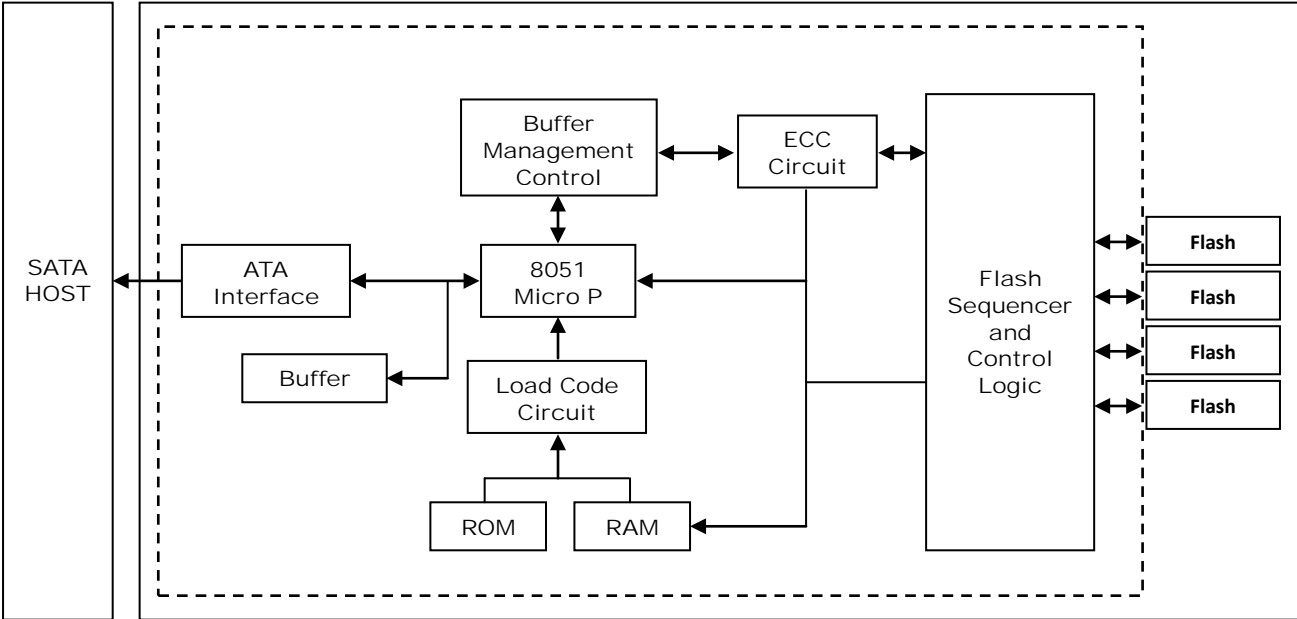

Figure 1: APRO Industrial SATA III CFast Card HERMES-I Series controller block diagram

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1.1. *Scope*

This document describes features, specifications and installation guide of APRO's Industrial SATA III CFast Card – HERMES-I 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
- 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 are 4GB, 8GB, 16GB, 32GB and 64GB
- Sequential read performance up to 330.0 MB/sec
- Sequential write performance up to 190.0 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 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 SATA III CFast Card HERMES-I 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 SATA III CFast Card		Standard Grade	Industrial Grade
HERMES-I Series		SxCFAxxxG-JICTC	WxCFAxxxG-JIITI
Temperature	Operating:	0ºC ~ +70ºC	-40ºC ~ +85ºC
	Non-operating:	-20ºC ~ +80ºC	-50ºC ~ +95ºC
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 SATA III CFast Card	Standard Grade	Industrial Grade
HERMES-I Series	SxCFAxxxG-JICTC	WxCFAxxxG-JIITI
DC Input Voltage (VCC)	3.3V±5%	
Reading Mode :	305 (max.)	
Writing Mode :	342 (max.)	
Idle Mode :	128 (max.)	

2.3. System Performance

Table 3: System Performances

Data Transfer Mode supporting		Serial ATA Gen-III (6.0Gb/s = 768MB/s)				
Maximum Performance	Capacity	4GB	8GB	16GB	32GB	64GB
	Sequential Read (MB/s)	160	310	320	330	330
	Sequential Write(MB/s)	60	110	120	190	190
	4KB Random Read IOPS	7,900	10,900	11,500	11,500	11,500
	4KB Random Write IOPS	6,900	11,900	12,600	14,200	14,200

Note:

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

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

　　- Computer with AMD 3.0GHz processor

　　- Windows -7 Professional operating system

(3). 4KB Random R/W IOPS test by QD32.

2.4. *System Reliability*

Table 4: System Reliability

Wear-leveling Algorithms	Static Wear-leveling
Bad Blocks Management	Supportive
ECC Technology	40 bits per 1024 bytes
Endurance	Erase count up to 60,000 times
MTBF (Telcordia sr-332 / 25°C)	>3,000,000 hours

Table 5: TBW (TeraBytes Written)

TBW (Tera Bytes Written)		
Capacity	TBW(TB)	DWPD & Lifespan
4GB	23.4	Based on 60,000 erase count Lifespan = 5 Years
8GB	46.8	
16GB	93.6	
32GB	187.2	
64GB	374.4	

Note:

(1)   Total byteswritten is based on JEDEC 218(SSD Requirements and Endurance Test Method) & JEDEC 219(Enterprise Work loading)

(2)   Lifespan is calculated by device written per day.

2.5. *Physical Specifications*

Refer to Table 5 and see Figure 2 for SATA III CFast Card HERMES-I Series physical specifications and dimensions.

Table 6: Physical Specifications of APRO Industrial SATA III CFast Card-HERMES-I Series

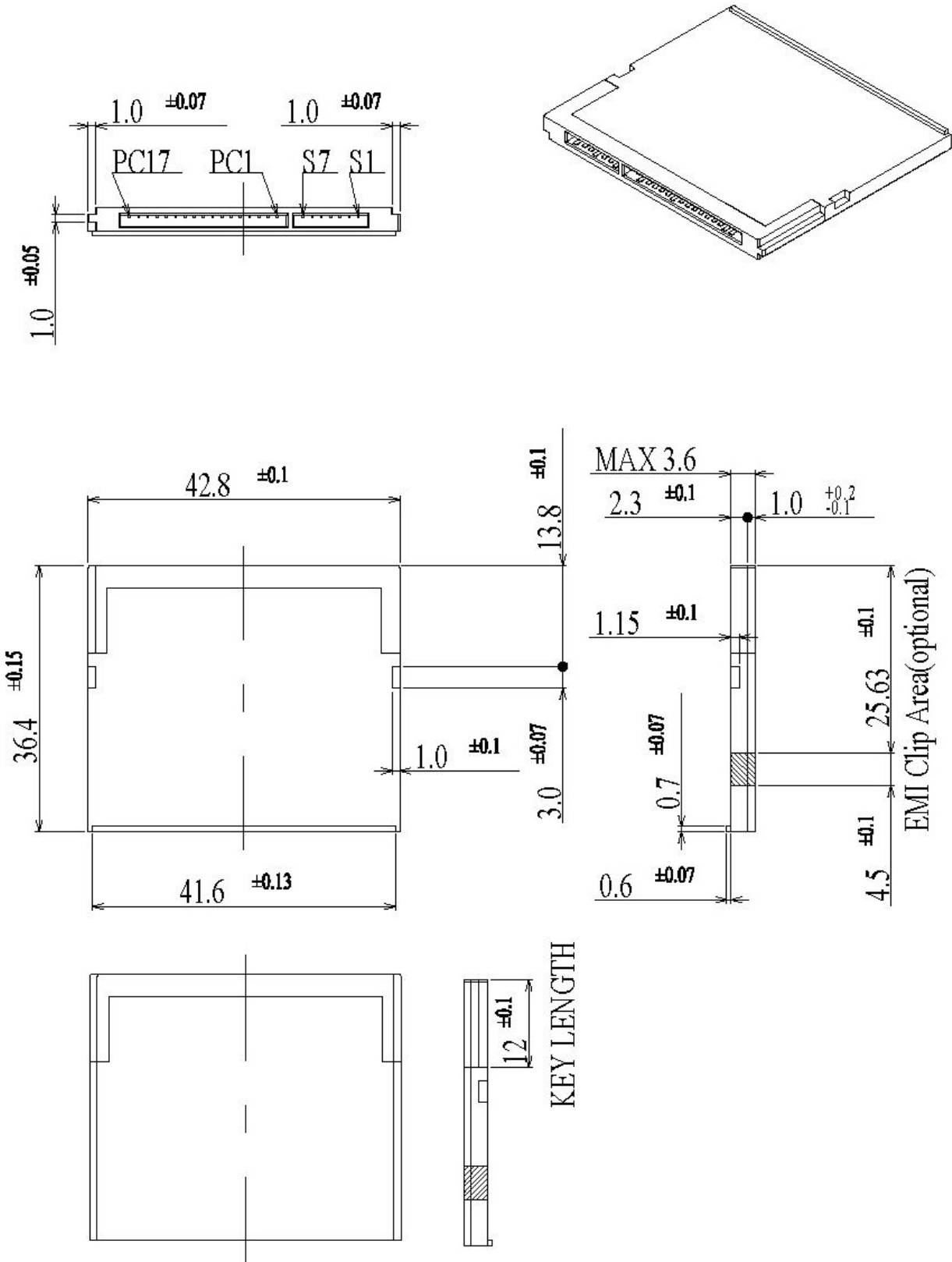| Length:	42.8 + 0.10mm / 1.69 in
Width:	36.4 + 0.15mm / 1.43 in
Thickness:	3.5 (3.6 max) + 0.1mm / 0.13 in (Based on CFast 1.0 Specification, the max. thickness is 3.6mm.)
Weight:	Plastic: 10g / 0.4oz ; Metal: 13g / 0.46oz

Figure 2: APRO Industrial SATA III CFast Card Dimension

APRO Industrial SATA III CFast Card – HERMES-I Series © 2018 APRO Co., Ltd.

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 storages 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.   Capacity Specifications

Table 7: Device Parameters

Unformatted Capacity	Cylinder	Head	Sector	LBA
4GB	7,773	16	63	7,835,184
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

2.7. *Pin Assignments*

Refer to Table 7 and see Figure 3 for APRO Industrial SLC CFast Card – HERMES-I 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 8: 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

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Appendix A: Ordering Information

1. **Part Number List**

◆ **APRO Industrial SATA III CFast Card – HERMES-I Series with Plastic frame Kit**

Product Picture	Grade	Standard grade (0ºC ~ 70ºC)	Industrial Grade (-40ºC ~ +85ºC)
	4GB	SPCFA004G-JICTC(/C)	WPCFA004G-JIITI(/C)
	8GB	SPCFA008G-JICTC(/C)	WPCFA008G-JIITI(/C)
	16GB	SPCFA016G-JICTC(/C)	WPCFA016G-JIITI(/C)
	32GB	SPCFA032G-JICTC(/C)	WPCFA032G-JIITI(/C)
	64GB	SPCFA064G-JICTC(/C)	WPCFA064G-JIITI(/C)

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

Product Picture	Grade	Standard grade (0ºC ~ 70ºC)	Industrial Grade (-40ºC ~ +85ºC)
	4GB	SRCFA004G-JICTC(/C)	WRCFA004G-JIITI(/C)
	8GB	SRCFA008G-JICTC(/C)	WRCFA008G-JIITI(/C)
	16GB	SRCFA016G-JICTC(/C)	WRCFA016G-JIITI(/C)
	32GB	SRCFA032G-JICTC(/C)	WRCFA032G-JIITI(/C)
	64GB	SRCFA064G-JICTC(/C)	WRCFA064G-JIITI(/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. 0º C ~ 70 º C

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

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	**032G:**	32GB
008G:	8GB	**064G:**	64GB
016G:	16GB		

X11 : **Controller**

J : JMicron controller

X12 : Controller version

I : HERMES-I Series

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 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:

- **SLC STD. Grade**   **3 years / Within 60K Erasing Counts**
- **SLC IND. 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.