



# Industrial

## SLC PCMCIA ATA Card

### HERMIT-F Series

### **Product Specification**

INDUSTRIAL

SLC PCMCIA ATA Card

Version 01V0

Document No. 100-xPAFC-HFTS

May. 2018

**APRO CO., LTD.**

Phone: +88628226-1539

Fax: +88628226-1389

This document is for information use only and is **subject to change without prior notice**. APRO Co., Ltd. assumes no responsibility for any errors that may appear in this document, nor for incidental or consequential damages resulting from the furnishing, performance or use of this material. No part of this document may be reproduced, transmitted, transcribed, stored in a retrievable manner or translated into any language or computer language, in any form or by any means, electronic, mechanical, magnetic, optical, chemical, manual or otherwise, without the prior written consent of an officer of APRO Co., Ltd.

All parts of the APRO documentation are protected by copyright law and all rights are reserved.

APRO and the APRO logo are registered trademarks of APRO Co., Ltd.

Product names mentioned herein are for identification purposes only and may be trademarks and/or registered trademarks of their respective companies.

© 2018 APRO Corporation. All rights reserved.

#### Revision History

Revision	Description	Date
1.0	Initial release	2018/05/20

# CONTENTS

<b>1.</b>	<b>INTRODUCTION .....</b>	<b>- 2 -</b>
1.1.	SCOPE .....	- 3 -
1.2.	SYSTEM FEATURES .....	- 3 -
1.3.	FLASH MANAGEMENT TECHNOLOGY_STATIC, DYNAMIC, AND GLOBAL WEAR LEVELING.....	- 3 -
1.4.	PROTECTED AGAINST DATA CORRUPTION AND FAILING DEVICES .....	- 4 -
<b>2.</b>	<b>PRODUCT SPECIFICATIONS .....</b>	<b>- 4 -</b>
2.1.	SYSTEM ENVIRONMENTAL SPECIFICATIONS .....	- 4 -
2.2.	SYSTEM POWER REQUIREMENTS .....	- 4 -
2.3.	SYSTEM PERFORMANCE .....	- 5 -
2.4.	SYSTEM RELIABILITY.....	- 5 -
2.5.	PHYSICAL SPECIFICATIONS .....	- 6 -
2.5.1.	CONFORMAL COATING.....	- 8 -
2.6.	DEVICE PARAMETER.....	- 8 -
<b>3.</b>	<b>INTERFACE DESCRIPTION .....</b>	<b>- 8 -</b>
3.1.	APRO ULTRA HIGH RANDOM SPEED PCMCIA ATA CARD INTERFACE .....	- 8 -
3.2.	PIN ASSIGNMENTS .....	- 9 -
	<b>APPENDIX A: ORDERING INFORMATION .....</b>	<b>- 10 -</b>
1.	PART NUMBER LIST .....	- 10 -
2.	PART NUMBER DECODER: .....	- 11 -
	<b>APPENDIX B: LIMITED WARRANTY.....</b>	<b>12</b>

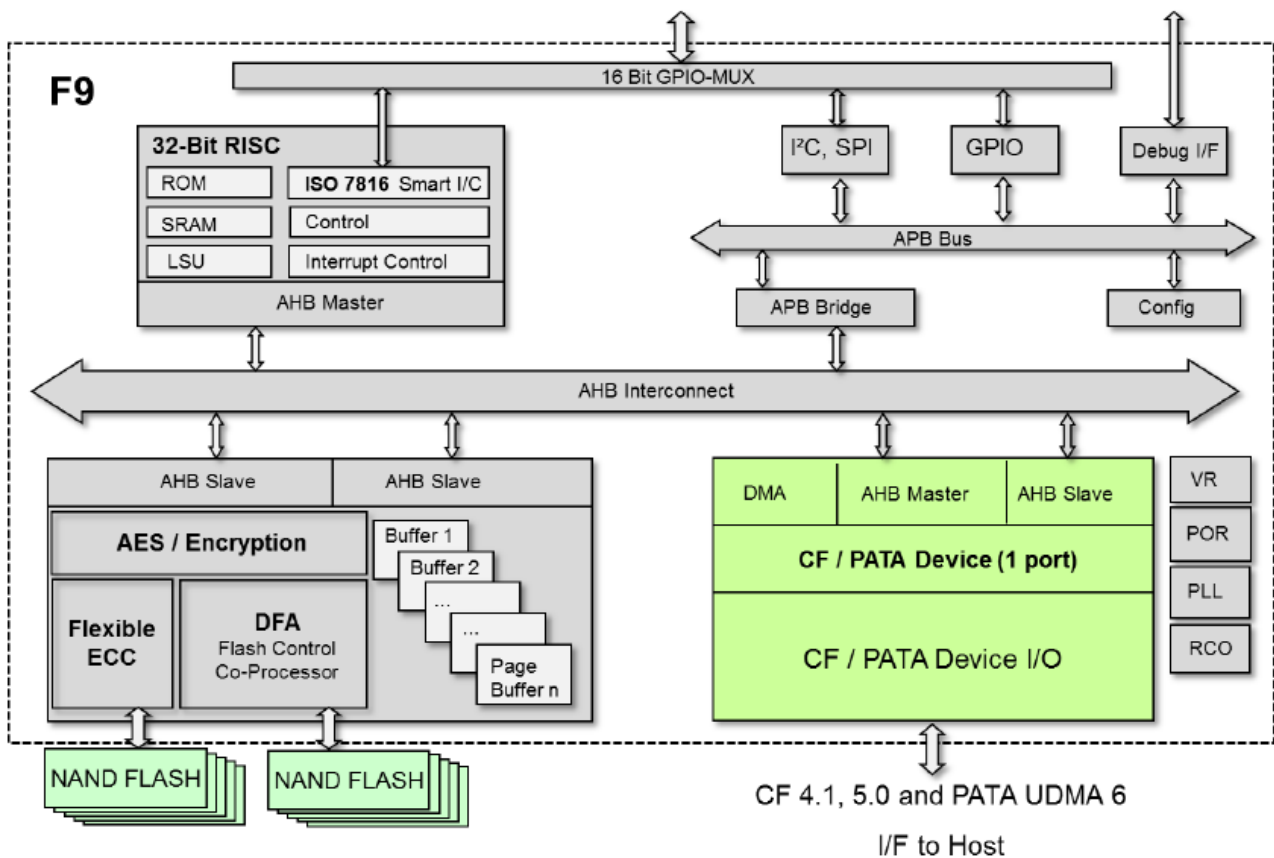
**1. Introduction**

APRO Ultra High Random Speed PCMCIA ATA Card – HERMIT-F Series provides **ULTRA HIGH RANDOM SPEED** performance that electrically complies with ATA/ATAPI 7 standard. APRO Ultra High Random Speed PCMCIA ATA Card – HERMIT-F Series support UDMA-6 with high random write (4K data size) performance. The main used flash memories are SLC-NAND type flash memory chips. The available disk capacities are 128MB, 256MB, 512MB, 1GB, 2GB, 4GB, 8GB, 16GB, 32GB and 64GB.

The operating temperature grade is optional for Standard grade 0°C ~ 70°C and industrial grade -40°C ~ +85°C. The data transfer performance by sequential read is up to 59.0 MB/sec (16GB) and sequential write is up to 58.0 MB/sec (16GB); 4K data random read is up to 10.7MB/sec (8GB), and 4K data random write is up to 10.0MB/sec (8GB).

APRO Ultra High Random Speed PCMCIA ATA Card products provide a high level interface to the host computer. This interface allows a host computer to issue commands to the SLC PCMCIA ATA Card to read or write blocks of memory. Each sector is protected by a flexible 96-Bit/1KB BCH ECC engine. APRO Ultra High Random Speed PCMCIA ATA Card HERMIT-F 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 PCMCIA ATA Card controller.



**Figure 1: APRO Ultra High Random Speed PCMCIA ATA Card HERMIT-F Series controller block diagram**

## 1.1. Scope

This document describes features, specifications and installation guide of APRO Ultra High Random Speed PCMCIA ATA Card – HERMIT-F Series. The appendix provides order information, warranty policy, RMA/DOA procedure for the most convenient reference.

## 1.2. System Features

- SLC-NAND type flash technology
- ATA interface and support PC Card Memory mode, PC Card I/O mode and True IDE mode
- PC-Card 8.0 (PC-Card ATA) standard compatible
- ATA-7 standard compatible in True-IDE mode
- Fast ATA host-to-buffer transfer rates supporting PIO mode 3~6, MDMA mode 4, UDMA mode 6 in True-IDE mode
- Optional of extremely rugged metal casing to endure harsh environments
- Non-volatile memory and no moving parts
- SLC Flash SSD standard grade capacity from 128MB up to 64GB
- Sequential read performance up to 59.0 MB/sec (16GB).
- Sequential write performance up to 58.0 MB/sec (16GB).
- 4K data random read performance up to 10.7 MB/sec. (QD32) (8GB)
- 4K data random write performance up to 10.0 MB/sec. (QD32) (8GB)
- Flexible 96-Bit/1KB BCH ECC engine.
- +3.3V  $\pm$  5% / +5V  $\pm$  10% operation
- Shock : 0.5ms, 1500 G, 3 axes
- Vibration : 7 Hz to 2K Hz, 20G, 3 axes
- Built-in Low Voltage Detector
- Very high performance, very low power consumption
- Low weight, Noiseless
- Standard grade supports operating temperature 0°C to +70°C, and Industrial Grade supports -40°C to +85°C

## 1.3. Flash Management Technology\_Static, Dynamic, and Global Wear leveling

- **Dynamic:**  
Blocks with lowest erase count selected for writing from free block list
- **Static:**  
When a block is added to the free list, its erase count is compared to the overall lowest erase count; if the distance is higher than the WL-threshold, data content is swapped (GC) and the block with low erase count moves to the free blocks
- **Global:**  
Both dynamic and static WL is global within ILV channel  
Done in background, interruptible by host commands

### 1.4. Protected against data corruption and failing devices

- **Sudden Power Fail (SPF) Event**
  - Reset of controller and immediate write protection of flash
  - If the last data written is corrupt, controller recovers latest valid entry
  - If a write operation is active at power loss this data might be lost
- **Transaction-oriented logging of mapping changes**
  - All mapping information is kept in non-volatile storage
  - MLC-aware Power Fail Management
  - Option: Reliable Write of user data
- **Rigorous Testing to ensure functionality**
  - Power Cycling Test
  - Stress Test
  - Regression Test

## 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 Ultra High Random Speed PCMCIA ATA Card		Standard Grade	Industrial Grade
HERMIT-F Series		SxAFCxxxG-HFCTC-UF	WxAFCxxxG-HFITI-UF
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 Ultra High Random Speed PCMCIA ATA Card	
HERMIT-F Series	
DC Input Voltage (VCC)	+3.3V ± 10% / +5V ± 10%
Reading Mode :	113.3 mA (max.)
Writing Mode :	84.6mA (max.)
Idle Mode :	10.4 mA (max.)

### 2.3. System Performance

**Table 3: System Performances**

<b>Data Transfer Mode</b>	PIO 3~6, MWDMA 0~4, UDMA 0~6 supported									
<b>Access Time</b>	0.684 ms (32GB)									
<b>Capacity</b>	<b>128MB</b>	<b>256MB</b>	<b>512MB</b>	<b>1GB</b>	<b>2GB</b>	<b>4GB</b>	<b>8GB</b>	<b>16GB</b>	<b>32GB</b>	<b>64GB</b>
<b>Sequential Read (MB/s)</b>	24.6	28.2	32.0	57.6	57.9	60.8	60.6	59.0	58.6	55.4
<b>Sequential Write(MB/s)</b>	4.9	8.4	13.0	25.3	27.1	49.68	50.2	58.3	57.5	56.4
<b>4K Random Read (MB/s)</b>	9.8	9.6	10.2	10.0	10.5	10.5	10.7	9.9	9.8	8.5
<b>4K Random Write(MB/s)</b>	1.1	2.6	6.4	6.8	8.3	10.2	10.0	10.0	10.2	9.0

Note:

- (1). All values quoted are typically at 25 °C and nominal supply voltage.
- (2). Testing of the SLC PCMCIA ATA Card maximum performance was performed under the following platform:
  - Computer with AMD processor
  - Windows 7 Professional operating system

### 2.4. System Reliability

**Table 4: System Reliability**

<b>Wear-leveling Algorithms</b>	Global Wear-leveling	
<b>Bad Blocks Management</b>	Supported	
<b>ECC Technology</b>	Flexible 96-Bit/1KB BCH ECC engine	
<b>Endurance</b>	<b>SLC STD. Grade</b>	<b>3 years / Within 60K Erasing Counts</b>
	<b>SLC IND. Grade</b>	<b>5 years / Within 60K Erasing Counts</b>
<b>Capacity</b>	<b>TBW(TB)</b>	<b>Estimated Life(Year) Write Budget [8,192MB/day]</b>
<b>128MB</b>	1.0	0.4
<b>256MB</b>	2.2	0.7
<b>512MB</b>	3.9	1.3
<b>1GB</b>	8	2.7
<b>2GB</b>	16.1	5.5
<b>4GB</b>	31.3	10.7
<b>8GB</b>	56.1	19.2
<b>16GB</b>	112.6	38.6
<b>32GB</b>	225.6	77.3
<b>64GB</b>	451.7	154.7

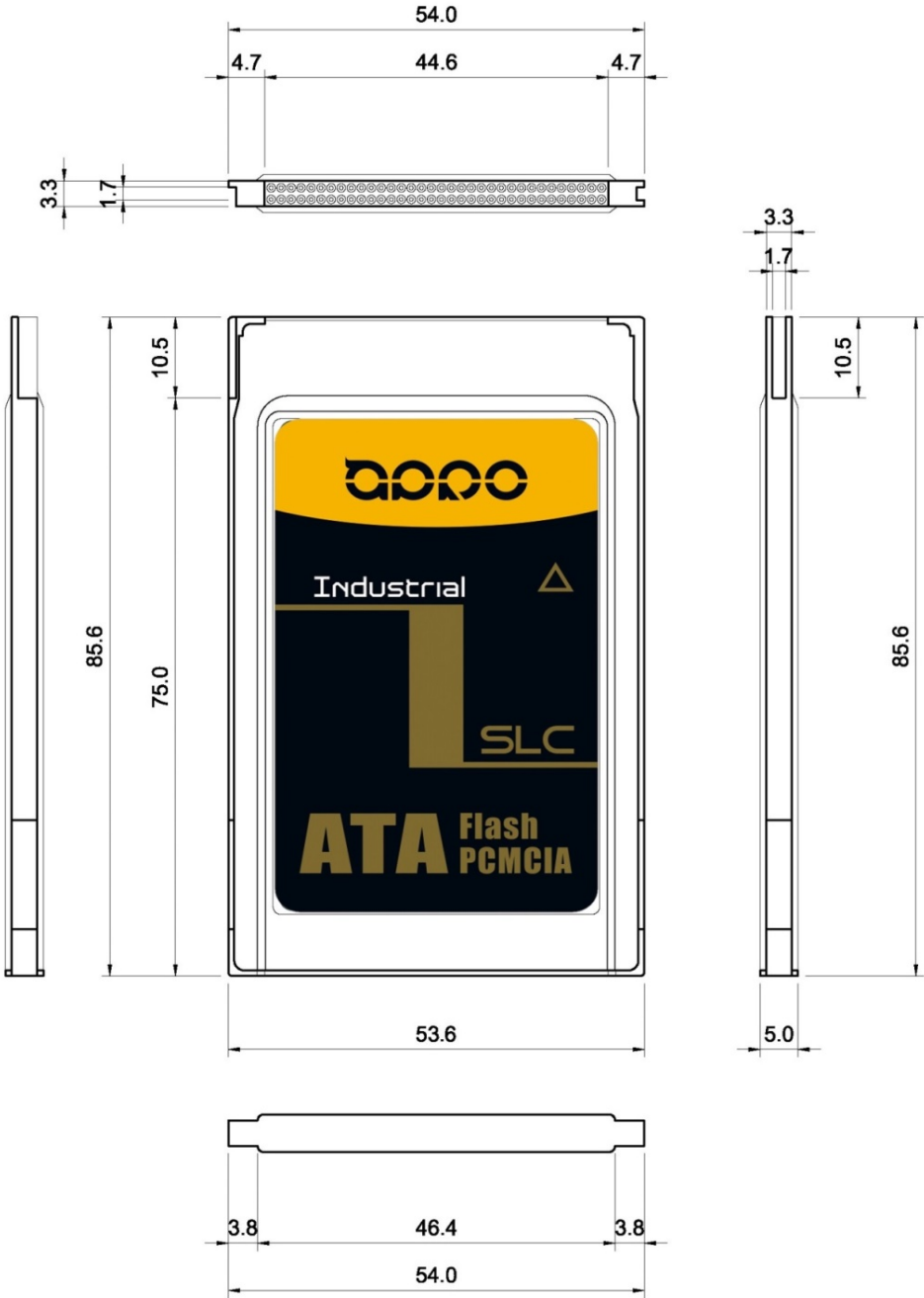
Note: Total bytes written is based on JEDEC 218 (Solid-State Drive Requirements and Endurance Test Method)

2.5. Physical Specifications

Refer to Table 5 and see Figure 3 for SLC PCMCIA ATA Card HERMIT-F Series physical specifications and dimensions.

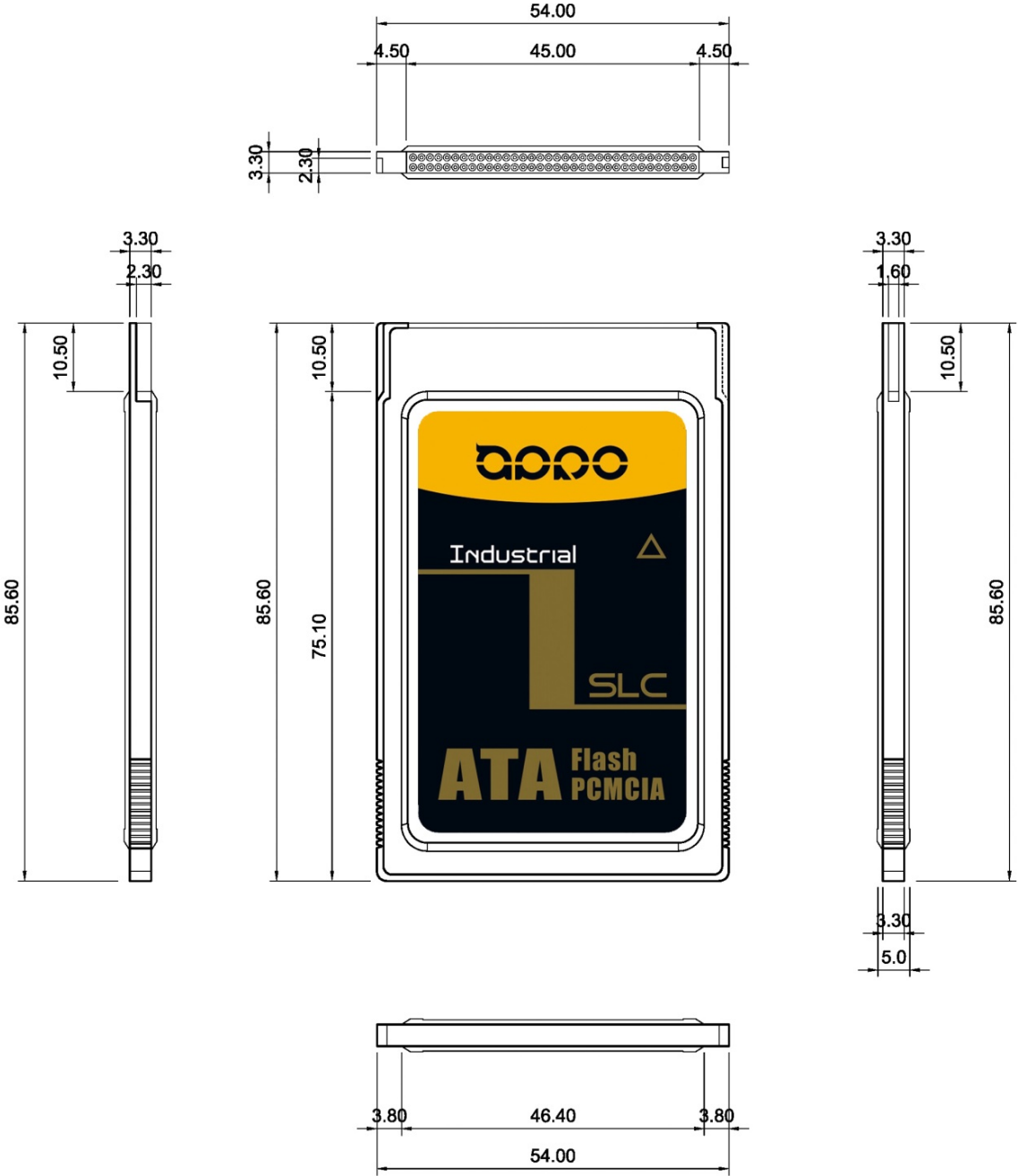
Table 5: Physical Specifications of APRO Ultra High Random Speed PCMCIA ATA Card-HERMIT-F Series

<b>Length:</b>	85.60±0.15mm(3.37±0.006 in)
<b>Width:</b>	54.00±0.10mm(2.13±0.004 in)
<b>Thickness:</b>	3.30±0.10mm / 5.00±0.10mm(0.2±0.004 in)
<b>Weight:</b>	Standard casing : 43.0g / 1.52oz Metal casing : 60.0g / 2.12 oz



Plastic Frame-Kit PCMCIA ATA CARD





**Rugged Metal Frame-Kit PCMCIA ATA CARD**

*Figure 2: APRO Ultra High Random Speed PCMCIA ATA 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

## 2.6. Device Parameter

The table 6 shows the specific capacity for the various models and the default number of heads, sectors/track and cylinders.

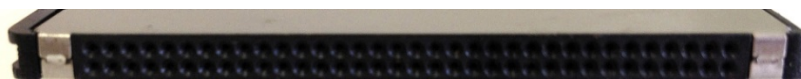
**Table 6: Device Parameter**

Unformatted Capacity	Cylinder	Head	Sector	CHS Total Sectors	LBA Total Sectors
128MB	433	16	63	249,408	249,410
256MB	557	16	55	490,160	490,167
512MB	1,137	16	54	982,368	982,370
1GB	3,411	16	63	1,964,736	1,964,740
2GB	3,897	16	63	3,928,167	3,928,167
4GB	7,773	16	63	7,835,184	7,835,184
8GB	16,383	16	35	9,174,480	15,649,200
16GB	16,383	16	63	16,514,064	31,277,232
32GB	16,383	15	61	15,989,808	62,533,296
64GB	65,535	16	63	66,059,280	125,045,424

## 3. Interface Description

### 3.1. APRO Ultra High Random Speed PCMCIA ATA Card interface

The PCMCIA ATA Card uses a 68 pin connector. The connector in the host consists of two rows of 34 pins with 0.05 inch spacing (1.27mm). Female pins are used on the card side, male pins on the system end.



**Figure 3 : The connectors of SLC PCMCIA ATA Card**

## Appendix A: Ordering Information

### 3.2. Pin Assignments

Refer to Table 6 for APRO SLC PCMCIA ATA Card – HERMIT-F Series pin assignments. There are total of 68 pins in the signal segment.


**Table 6 - Pin Assignments and Pin Type**

Pin	Name	Descriptions	Pin	Name	Descriptions	Pin	Name	Descriptions
01	GND	Ground	31	D1	I/O	61	REG#	I
02	D3	I/O	32	D2	I/O	62	BVD2	I/O
03	D4	I/O	33	WP	O	63	BVD1	I/O
04	D5	I/O	34	GND	Ground	64	D81	I/O
05	D6	I/O	35	GND	Ground	65	D91	I/O
06	D7	I/O	36	CD1#	O	66	D101	I/O
07	CE1#	I	37	D111	I/O	67	CD2#	O
08	A10	I	38	D121	I/O	68	GND	Ground
09	OE#	I	39	D131	I/O			
10	NC	-	40	D141	I/O			
11	A9	I	41	D151	I/O			
12	A8	I	42	CE2#1	I			
13	NC	-	43	VS1#	O			
14	NC	-	44	IORD#	I			
15	WE#	I	45	IOWR#	I			
16	RDY/BSY#	O	46	NC	-			
17	VCC	Power	47	NC	-			
18	NC	-	48	NC	-			
19	NC	-	49	NC	-			
20	NC	-	50	NC	-			
21	NC	-	51	VCC	Power			
22	A7	I	52	NC	-			
23	A6	I	53	NC	-			
24	A5	I	54	NC	-			
25	A4	I	55	NC	-			
26	A3	I	56	NC	-			
27	A2	I	57	VS2#	O			
28	A1	I	58	RESET	I			
29	A0	I	59	WAIT#	O			
30	D0	I/O	60	INPACK#	O			


**Appendix A: Ordering Information**

**1. Part Number List**

◆ **APRO PCMCIA ATA Card – HERMIT-F Series (Plastic frame)**

<b>Product Picture</b>	<b>Grade</b>	<b>Standard grade (0°C ~ 70°C)</b>	<b>Industrial grade ( -40°C ~ +85°C )</b>
	<b>128MB</b>	SPAFC128M-HFCTC-UF	WPAFC128M-HFITI-UF
	<b>256MB</b>	SPAFC256M-HFCTC-UF	WPAFC256M-HFITI-UF
	<b>512MB</b>	SPAFC512M-HFCTC-UF	WPAFC512M-HFITI-UF
	<b>1GB</b>	SPAFC001G-HFCTC-UF	WPAFC001G-HFITI-UF
	<b>2GB</b>	SPAFC002G-HFCTC-UF	WPAFC002G-HFITI-UF
	<b>4GB</b>	SPAFC004G-HFCTC-UF	WPAFC004G-HFITI-UF
	<b>8GB</b>	SPAFC008G-HFCTC-UF	WPAFC008G-HFITI-UF
	<b>16GB</b>	SPAFC016G-HFCTC-UF	WPAFC016G-HFITI-UF
	<b>32GB</b>	SPAFC032G-HFCTC-UF	WPAFC032G-HFITI-UF
	<b>64GB</b>	SPAFC064G-HFCTC-UF	WPAFC064G-HFITI-UF

◆ **APRO PCMCIA ATA Card – HERMIT-F Series (Rugged Metal frame)**

<b>Product Picture</b>	<b>Grade</b>	<b>Standard grade (0°C ~ 70°C)</b>	<b>Industrial grade ( -40°C ~ +85°C )</b>
	<b>128MB</b>	SRAFC128M-HFCTC-UF	WRAFC128M-HFITI-UF
	<b>256MB</b>	SRAFC256M-HFCTC-UF	WRAFC256M-HFITI-UF
	<b>512MB</b>	SRAFC512M-HFCTC-UF	WRAFC512M-HFITI-UF
	<b>1GB</b>	SRAFC001G-HFCTC-UF	WRAFC001G-HFITI-UF
	<b>2GB</b>	SRAFC002G-HFCTC-UF	WRAFC002G-HFITI-UF
	<b>4GB</b>	SRAFC004G-HFCTC-UF	WRAFC004G-HFITI-UF
	<b>8GB</b>	SRAFC008G-HFCTC-UF	WRAFC008G-HFITI-UF
	<b>16GB</b>	SRAFC016G-HFCTC-UF	WRAFC016G-HFITI-UF
	<b>32GB</b>	SRAFC032G-HFCTC-UF	WRAFC032G-HFITI-UF
	<b>64GB</b>	SRAFC064G-HFCTC-UF	WRAFC064G-HFITI-UF

### 2. Part Number Decoder:

**X1 X2 X3 X4 X5 X6 X7 X8 X9** — **X11 X12 X13 X14 X15** — **Z1 Z2** — **C**

**X1** : Grade

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

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

**X2** : The material of case

**P** : Plastic frame

**R** : Rugged metal frame

**X3 X4 X5** : Product category

**AFC** : PCMCIA ATA Card

**X6 X7 X8 X9** : Capacity

<b>128M:</b>	128MB	<b>004G:</b>	4GB
<b>256M:</b>	256MB	<b>008G:</b>	8GB
<b>512M:</b>	512MB	<b>016G:</b>	16GB
<b>001G:</b>	1GB	<b>032G:</b>	32GB
<b>002G:</b>	2GB	<b>064G:</b>	64GB

**X11** : Controller

**H** : Hyperstone (HERMIT 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

**Z1 Z2** : Data Transfer Rate

**PF** : PIO-6 mode / fixed disk type

**PR** : PIO-6 mode / removable disk type

**UF** : Defaulted as UDMA-6 mode / fixed disk type

**UR** : UDMA-6 mode / removable disk type

**AA** : PIO/UDMA & fixed/removable disk type auto-detected

**C** : Reserved for specific requirement

**C** : Conformal-coating

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

APRO warrants your SLC PCMCIA ATA 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:***

- 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.***