SLC

Industrial CompactFlash® Card

HERMIT-A Series

Supports Write Protect Function

Document No. : 100-xxCFWTL

Version No. : 02V0

Date : June, 2019

ISO 9001 : 2015 CERTIFIED

Product Features

- ■ **Flash IC**

  - TOSHIBA NAND Flash IC.

  - Single-Level Cell (SLC) management technology.

- ■ **Compatibility**

  - CF 3.0 standard compatible.

  - PC-Card (PC-Card ATA) standard compatible.

  - PCMCIA specification version 2.1 compatible.

  - ATA-6 standard compatible in True-IDE mode.

- ■ **Additional Capabilities**

  - Fast ATA host-to-buffer transfer rates supporting PIO mode 6, MDMA mode 2, UDMA mode 4 in True-IDE mode

  - S.M.A.R.T.[1] (Self-Monitoring, Analysis and Reporting Technology) feature set support.

  - Static wear leveling algorithm

  - Support bad Block Management

  - Support hardware switch Write-Protect function.

- ■ **Mechanical**

  - Standard 50-pin connector consisting of two rows of 25 female contacts.

  - Write-Protect switch on the bottom of frame-kit.

  - Dimension: 42.8 mm x 36.4 mm x 3.3 mm.

  - Weight: 12g / 0.42 oz.

- ■ **Power: Operating Voltage @ 5V(+/-) 10%**

  - Read Mode: 168.9 mA (max.)

  - Write Mode: 151.5 mA (max.)

  - Idle Mode: 2.4 mA (max.)

- ■ **Performance (Maximum value) [2]**

  - Sequential Read: 36.4 MB/sec. (max.)

  - Sequential Write: 26.5 MB/sec. (max.)

- ■ **Capacity**

  - 16MB, 32MB, 64MB, 128MB, 256MB, 512MB, 1GB, 2GB and 4GB.

- ■ **Reliability**

  - **TBW:** Up to 210.9 TBW at 4GB Capacity.

    (Test by sequential write)

  - **MTBF:** > 3,000,000 hours

  - **ECC:** 4-Bit per 512 bytes in an ECC block.

  - **Temperature:** (Operating)

    Standard Grade: 0°C ~ +70°C

    Industrial Grade: -40°C ~ +85°C

  - **Vibration:** 70 Hz to 2K Hz, 20G, 3 axes.

  - **Shock:** 0.5ms, 1500 G, 3 axes

- ■ **Certifications and Declarations**

  - **Certifications**: CE & FCC

  - **Declarations**: RoHS & REACH

Remarks:

1. Support official S.M.A.R.T. Utility.

2. Sequential performance is based on CrystalDiskMark 5.1.2 with file size 100MB

Order Information

I. Part Number List

◆ **APRO SLC Industrial Write-Protection CompactFlash® Card HERMIT-A Series**

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Industrial Grade (-40°C ~ +85°C)
	16MB	SPCFW016M-HACTC-UF	WPCFW016M-HAITI-UF
	32MB	SPCFW032M-HACTC-UF	WPCFW032M-HAITI-UF
	64MB	SPCFW064M-HACTC-UF	WPCFW064M-HAITI-UF
	128MB	SPCFW128M-HACTC-UF	WPCFW128M-HAITI-UF
	256MB	SPCFW256M-HACTC-UF	WPCFW256M-HAITI-UF
	512MB	SPCFW512M-HACTC-UF	WPCFW512M-HAITI-UF
	1GB	SPCFW001G-HACTC-UF	WPCFW001G-HAITI-UF
	2GB	SPCFW002G-HACTC-UF	WPCFW002G-HAITI-UF
	4GB	SPCFW004G-HACTC-UF	WPCFW004G-HAITI-UF

Notes:

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

II. Part Number Decoder:

X1 X2 X3 X4 X5 X6 X7 X8 X9 — X11 X12 X13 X14 X15 — X17 X18 X19

X1 : **Grade**

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

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

X2 : **The material of case**

P : Plastic frame kit

X3 X4 X5 : **Product category**

CFW : CompactFlash® Card supports Write Protect function

X6 X7 X8 X9 : **Capacity**

16M:	16MB	**512M:**	512MB
32M:	32MB	**001G:**	1GB
64M:	64MB	**002G:**	2GB
128M:	128MB	**004G:**	4GB

X11 : **Controller**

H : 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

X17 X18 : **Data Transfer Rate**

PF : PIO-6 mode / fixed disk type

PR : PIO-6 mode / removable disk type

UF : Defaulted as UDMA-4 mode / fixed disk type

UR : UDMA-4 mode / removable disk type

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

X19 : **Reserved for specific requirement**

C : Conformal coating (optional)

Revision History

Revision	Description	Date
1.0	Initial release	2010/07/21
1.1	Updated Version	2018/11/28
2.0	Updated power consumption & performance	2019/05/02
2.1	Updated document form	2019/06/10

Contents

1.   Introduction

APRO SLC Industrial Write-Protection CompactFlash® Card HERMIT-A Series provides high speed performance that electrically complies with ATA-6 standard and CF 3.0 standard compatible. The main used flash memories are SLC-NAND type flash memory chips. The available disk capacities are 16MB, 32MB, 64MB, 128MB, 256MB, 512MB, 1GB, 2GB and 4GB.

APRO SLC Industrial Write-Protection CompactFlash® Card HERMIT-A Series supports operating temperature for standard grade 0°C ~ 70°C and industrial grade -40°C ~ +85°C. The APRO SLC Industrial Write-Protection CompactFlash® Card HERMIT-A Series also supports S.M.A.R.T. function and designed electrically complies with the conventional IDE hard drive and support True IDE Mode. The data transfer modes supports PIO mode 0, 1, 2, 3, 4, 5, 6 or MWDMA- 0, 1, 2 or UDMA- 0, 1, 2, 3, 4. The fastest reading speed is up to 36.4 MB/sec and writing speed is up to 26.5 MB/sec.

APRO SLC Industrial Write-Protection CompactFlash® Card HERMIT-A Series products provide highly sophisticated Error Correction Code algorithms are implemented. The ECC unit consists of the Parity Unit (parity-byte generation) and the Syndrome Unit (syndrome-byte computation). This unit implements an algorithm that can correct 4 bits per 512 bytes in an ECC block.

In order to sustain various harsh and tough operating environments, APRO especially delivers the CompactFlash® frame kit in rugged metal as well as provides the optional treatment of conformal coating upon customers' request.

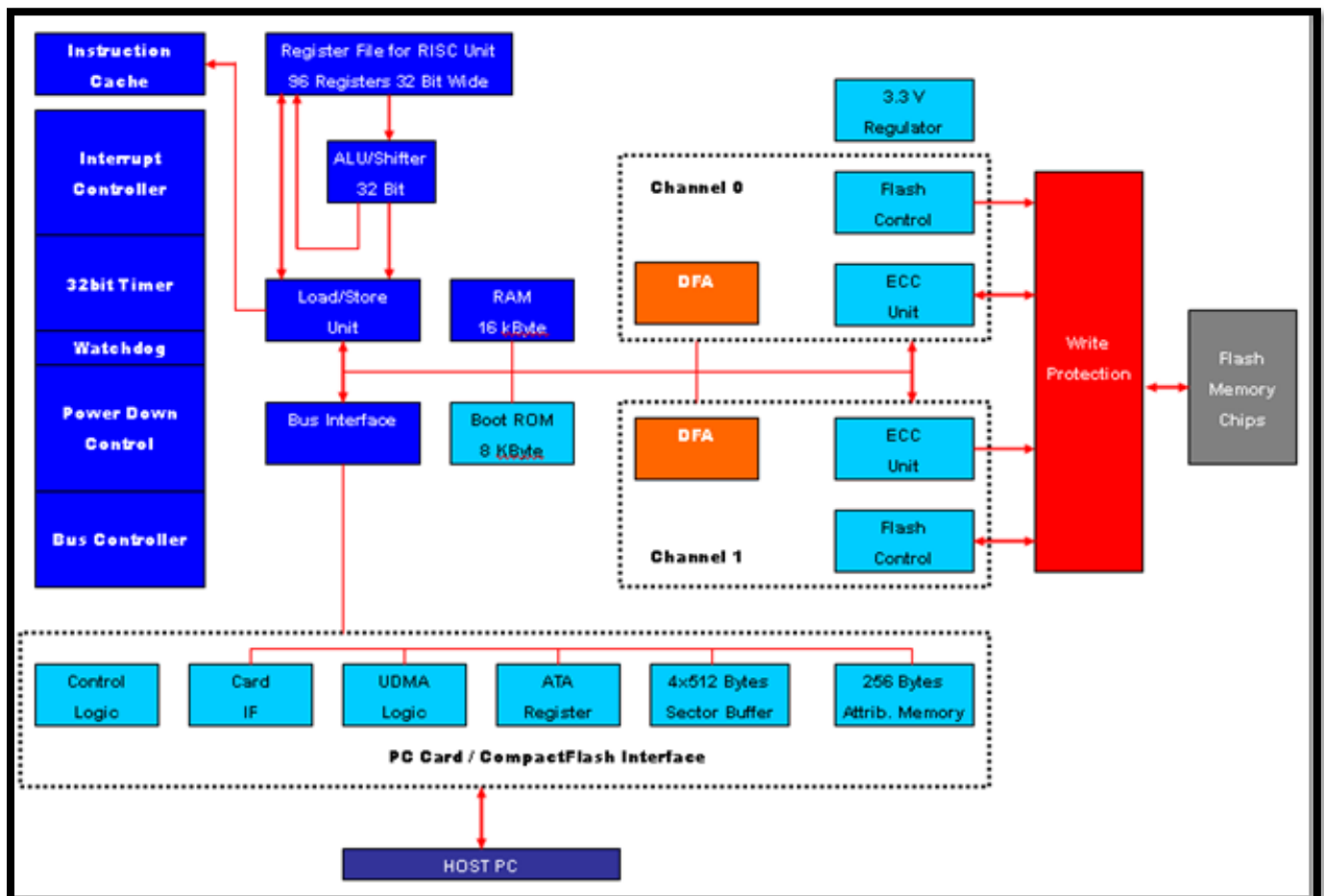Figure 1 shows a block diagram of the APRO SLC Industrial Write-Protection CompactFlash® Card HERMIT-A Series.

Figure 1: APRO SLC Industrial Write-Protection CompactFlash® Card HERMIT-A Series block diagram

1.1. *Scope*

This document describes features, specifications and installation guide of APRO SLC Industrial Write-Protection CompactFlash® Card HERMIT-A Series. The appendix provides order information, warranty policy, RMA/DOA procedure for the most convenient reference.

1.2. *Flash Management Technology – Static Wear leveling*

In order to gain the best management for flash memory, APRO Industrial CF card – HERMIT 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.

1.3. *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

- SLC-aware Power Fail Management

- Option: Reliable Write of user data

➤ **Rigorous Testing to ensure functionality**

- Power Cycling Test

- Stress Test

- Regression Test

1.4. *Bad Block Management*

> **Early Bad Block**

The fault block generated during the manufacturing process of NAND Flash is called Early Bad Block.

> **Later Bad Block**

In the process of use, as the number of operations of writing and erasing increases, a fault block is gradually generated, which is called a Laᵗter Bad Block.

Bad block management is a management mechanism for a bad block to be detected by the control IC and mark bad blocks in the NAND Flash and improve the reliability of data access. The bad block management mechanism of the control IC will establish a **Bad Block Table** when the NAND Flash is started for the first time, and will also record the errors found in the process of use in the bad block table, and data is ported to new valid blocks to avoid data loss.

In order to detect the initial bad blocks to handle run time bad blocks, APRO SLC Industrial Write-Protection CompactFlash® Card HERMIT-A Series provides the **Bad Block Management** scheme. It remaps a bad block to one of the reserved blocks so that the data contained in one bad block is not lost and new data writes on a bad block is avoided.

1.5. *Mean Time Between Failure (MTBF)*

1.5.1. *Definition*

MTBF (Mean time between failures) is defined as failure or maintenance required for the average time including failure detection and maintenance for the device. For a simple and maintainable unit, MTBF = MTTF + MTTR.

MTTF (mean time to failure) is defined as the expectation of random variables for time to failure.

MTTR（mean time to restoration） is the expectation of random variables of time required for restoration which includes the time required for confirmation that a failure occurred, as well as the time required for maintenance.

1.5.2. *Obtaining MTBF*

There are two methods for obtaining MTBF:

A. MTBF software estimation method: by calculating all the MTBF data of all the components included in the bill of material, and the data of the completed products including actual parameters of voltage and electrical current using analysis software, the MTBF of the completed product is estimated.

B. MTBF sample test method: by determining a certain number of samples and a fixed time for testing, using a Arrhenius Model and Coffin-Manson Model to obtain parameters, and then using the formula with the parameters, the longevity and in so the reliability is proved.

Arrhenius Model: **Af = e{ (1/k × Ea (1/273+Tmax − 1/273+Ttest)}**

Coffin-Manson Model: **Af = (ΔTtest/ΔTuse)m**

> **APRO uses the A method to Estimate MTBF**

MTBF is actually obtained by calculation which is just an estimation of future occurrences. The main reason to use the first method is that the data contains the analysis by all the parameters of components and actual parameters of voltage and electrical current of finished products, which is considered adequate and objective.

➢ **Interpretation of MTBF Analysis**

APRO estimates MTBF using a prediction methodology based on reliability data for the individual components in APRO products. The predicted MTBF based on Parts stress analysis Method of Telcordia Special Report SR-332, for components failure rates. Component data comes from several sources: device life tests, failure analysis of earlier equipment, device physics, and field returns.

The Telcordia model is based on the Telcordia document, Reliability Prediction Procedure for Electronic Equipment, Technical Reference SR-332. This standard basically modified the component models in MIL-HDBK-217 to better reflect the failure rates that AT&T Bell Lab equipment was experiencing in the field and was originally developed by AT&T Bell Lab as the Bellcore model.

This model supports different failure rate calculation methods in order to support the taking into account of stress, burn-in, laboratory, or field data. A Parts Count or Parts Stress analysis is included in Telcordia performance. Relex supports Telcordia Issues 1 and 2 and also Bellcore Issues 4, 5, and 6.Telcordia Issue 2, released in September 2006, are supported by Relex and Telcordia Issue 1, released in May 2001, is replaced with Relex. Refer to Telcordia Issue 2 Fields for information about the fields in Relex Reliability Studio specific to Telcordia Issue 2.

➢ **Purpose of the analyses**

The purpose of these analyses is to obtain early estimation of device reliability during engineering and customer validation stages. The prediction results will expose the reliability of whole assembly, viewed as a set of serially connected electronic components. Rating of the assembly electronic components will show the ratio between actual critical elements parameters and their specification limits. The purpose of component rating is to improve a product's inherent design reliability, increase its number of operating times, and to reduce warranty costs and to achieve a more robust design.

1.5.3. Definitions

Term	Definition
Failure	The event, or inoperable state, in which any item or part of an item does not, or would not, perform as previously specified.
Failure rate	The total number of failures within an item population, divided by the total number of life units expended by that population, during a particular measurement interval under stated condition.
FIT	Failures In Time: the number of failures in 1 billion hours.
PPM	Part per million: the number of failures in 1 million hours.
Mean Time Between Failures (MTBF)	A basic measure of reliability for repairable items: The mean number of life units during which all parts of the item perform within their specified limits, during a particular measurement interval under stated conditions..
GB	Ground, Fixed, Controlled: Nearly zero environmental stress with optimum engineering operation and maintenance. Typical applications are central office, environmentally controlled vaults, environmentally controlled remote shelters, and environmentally controlled customer premise area.
GF	Ground, Fixed, Uncontrolled: Some environmental stress with limited maintenance. Typical applications are manholes, poles, remote terminals, and customer premise areas subject to shock, vibration, temperature, or atmospheric variations.

➢ **Software & Database**

Analysis Software & Analysis Method

Software Name : Relex Reliability Studio 2008

Software Version : Relex Studio 2008

Analysis Method

The prediction method used was Telcordia SR-332, Issue 2,

Parts Count

Failure rate (λ) = 10^9 hours (FITs)

MTBF=1/λ

$\lambda_{SSi} = \lambda_{Gi}\ TT_{Qi} TT_{Si} TT_{Ti}$

Where λ_{Gi} : Generic steady-state failure rate for device i

TT_{Qi} : Quality factor for device i

TT_{Si} : Stress factor for device i

TT_{Ti} : Temperature factor for device i

➢ **Calculation Parameter**

Operation Temperature : 25℃

Environment : Ground Benign, Controlled

Operation Stress : 50% (Voltage, Current, Power)

Method : Method I, Case 3

Products are advertised with MTBF up to 1 million hours in the market. Take one million hours as an example, the product's estimated life is 114 years. However, the current rapid progress of technology, advancement of flash storage device's manufacturing process research and development, and the supply period of former flash IC manufacturing processes are crucial to the actual life expectancy of flash products. In short, the MTBF of flash storage is for reference only. Good customer service and technical support provided by manufacturers is the most significant issue regarding to the life-span of products.

Remark:

All the details of testing and data are for reference only and do not imply any products performance as a result. MTBF is only an estimated date and is depends on both hardware and software. User shall not assume that all the products have the same MTBF as APRO estimates.

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 SLC Industrial CompactFlash® Card		Standard Grade	Industrial Grade
HERMIT-A Series		**SPCFWxxxG-HACTC-UF**	**WPCFWxxxG-HAITI-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:**	70 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 SLC Industrial Write-Protection CompactFlash® Card HERMIT-A Series	
DC Input Voltage (VCC) +5V ± 10% or +3.3V ± 10%	Operating @ +5V ± 10%
Reading Mode :	168.9 mA (max.)
Writing Mode :	151.5 mA (max.)
Idle Mode :	2.4 mA (max.)

2.3. System Performance

Table 3: System Performances

Data Transfer Mode	PIO 0~6, MWDMA 0~2, UDMA 0~4 supported								
Random Write Access Time	0.4 ms (64GB)								
Capacity	16MB	32MB	64MB	128MB	256MB	512MB	1GB	2GB	4GB
Sequential Read (MB/s)	17.1	17.1	17.4	17.6	17.8	19.8	37.4	36.1	36.4
Sequential Write (MB/s)	5.9	5.9	6.0	11.2	11.2	13.7	27.1	26.2	26.5

Note: The performance was measured using CrystalDiskMark by file size 500MB (QD32).

2.4. System Reliability

Table 4: System Reliability

Wear-leveling Algorithms	Static wear-leveling algorithms
Bad Blocks Management	Supported
ECC Technology	4-Bit per 512 bytes in an ECC block
Erase counts	NAND SLC Flash Cell Level : 60K P/E Cycles
Capacity	TBW(TB)
16MB	0.8
32MB	1.7
64MB	3.3
128MB	6.58
256MB	13.18
512MB	26.36
1GB	52.73
2GB	105.46
4GB	210.9

Note:

➢ *Samples were built using Toshiba SLC NAND flash.*

➢ *Test by sequential write.*

➢ *The endurance of SSD could be estimated based on user behavior, NAND endurance cycles, and write amplification factor.*

It is not guaranteed by flash vendor.

2.5. *Physical Specifications*

Refer to Table 5 and see Figure 3 for APRO SLC Industrial Write-Protection CompactFlash® Card HERMIT-A Series physical

specifications and dimensions.

Table 5: Physical Specifications of APRO SLC Industrial CompactFlash® Card-HERMIT-A Series

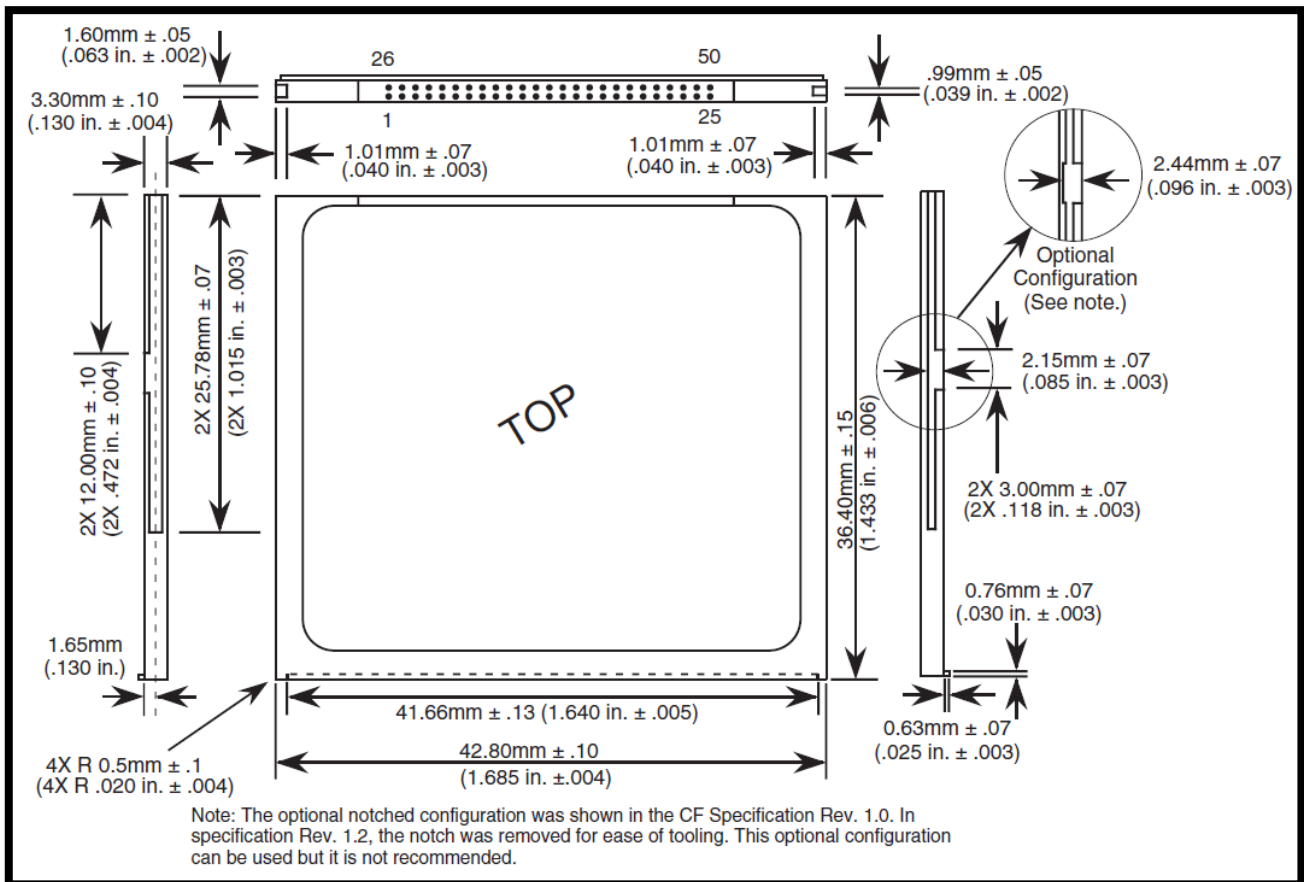| Length:	36.40 mm
Width:	42.80 mm
Thickness:	3.3 mm
Weight:	**Plastic frame-kit:** 12g / 0.42 oz.

Figure 3: APRO SLC Industrial CompactFlash® Card Dimension

2.6. *Write-protection CompactFlash® card functionality*

APRO SLC Industrial Write-Protection CompactFlash® Card HERMIT-A Series is designed with a lock switch which allows users to prevent the CF card from programming, writing, and deleting. All data have been written in the Write Protect function CF cards can be read even the CF cards are Write Protect functioned. If the users would like to avoid anyone to modify or destroy the stored data in the CompactFlash® cards, the users can switch-on the Write Protect function mechanism and the APRO's Write Protect function CompactFlash® cards would disable the data access to flash memories from data written in.

Figure-4 is the Write-protect switch on the frame of the CompactFlash® Card.

Figure 4: Industrial Write-protect switch on CompactFlash® Card

2.7. *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 use MIL-I-46058C silicon conformal coating

APRO

2.8. *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 of APRO SLC Industrial Write-Protection CompactFlash® Card HERMIT-A Series

Unformatted Capacity	Cylinder	Head	Sector	LBA Total Sectors
16MB	248	4	32	31,744
32MB	500	8	16	64,000
64MB	500	8	32	112,000
128MB	480	16	32	245,760
256MB	984	16	32	503,808
512MB	1,001	16	63	1,009,008
1GB	2,002	16	63	2,018,016
2GB	4,003	16	63	4,035,024
4GB	8,006	16	63	8,070,048

3. *Interface Description*

3.1. *CF Card interface (CompactFlash® Type I)*

APRO SLC Industrial Write-Protection CompactFlash® Card HERMIT-A Series equipped Standard 50-pin connector consisting of two rows of 25 female contacts.
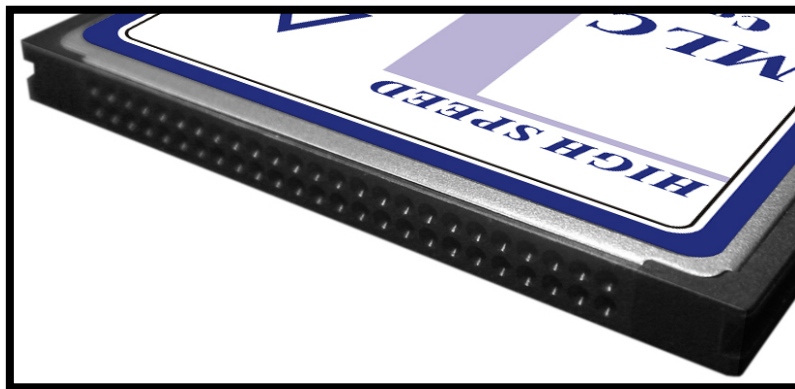

Figure 3: 50-pin CompactFlash® Type I Connector

3.2. Pin Assignments

Signals whose source is the host is designated as inputs while signals that the CompactFlash® (CF) Card sources are outputs. The pin assignments are listed in below table 7. The signal/pin assignments are listed in below Table 7. Low active signals have a "-" prefix. Pin types are Input, Output or Input/Output.

Table 7 - Pin Assignments of APRO SLC Industrial CompactFlash® Card-HERMIT-A Series

PC Card Memory Mode				PC Card I/O Mode				True IDE Mode[4]			
Pin No.	Signal Name	Pin Type	In, Out Type	Pin No.	Signal Name	Pin Type	In, Out Type	Pin No.	Signal Name	Pin Type	In, Out Type
1	GND		Ground	1	GND		Ground	1	GND		Ground
2	D03	I/O	11Z,OZ3	2	D03	I/O	11Z,OZ3	2	D03	I/O	11Z,OZ3
3	D04	I/O	11Z,OZ3	3	D04	I/O	11Z,OZ3	3	D04	I/O	11Z,OZ3
4	D05	I/O	11Z,OZ3	4	D05	I/O	11Z,OZ3	4	D05	I/O	11Z,OZ3
5	D06	I/O	11Z,OZ3	5	D06	I/O	11Z,OZ3	5	D06	I/O	11Z,OZ3
6	D07	I/O	11Z,OZ3	6	D07	I/O	11Z,OZ3	6	D07	I/O	11Z,OZ3
7	-CE1	I	13U	7	-CE1	I	13U	7	-CS0	I	13Z
8	A10	I	11Z	8	A10	I	11Z	8	A10[2]	I	11Z
9	-OE	I	13U	9	-OE	I	13U	9	-ATA SEL	I	13U
10	A09	I	11Z	10	A09	I	11Z	10	A09[2]	I	11Z
11	A08	I	11Z	11	A08	I	11Z	11	A08[2]	I	11Z
12	A07	I	11Z	12	A07	I	11Z	12	A07[2]	I	11Z
13	VCC		Power	13	VCC		Power	13	VCC		Power
14	A06	I	11Z	14	A06	I	11Z	14	A06[2]	I	11Z
15	A05	I	11Z	15	A05	I	11Z	15	A05[2]	I	11Z
16	A04	I	11Z	16	A04	I	11Z	16	A04[2]	I	11Z
17	A03	I	11Z	17	A03	I	11Z	17	A03[2]	I	11Z
18	A02	I	11Z	18	A02	I	11Z	18	A02	I	11Z
19	A01	I	11Z	19	A01	I	11Z	19	A01	I	11Z
20	A00	I	11Z	20	A00	I	11Z	20	A00	I	11Z
21	D00	I/O	11Z,OZ3	21	D00	I/O	11Z,OZ3	21	D00	I/O	11Z,OZ3
22	D01	I/O	11Z,OZ3	22	D01	I/O	11Z,OZ3	22	D01	I/O	11Z,OZ3
23	D02	I/O	11Z,OZ3	23	D02	I/O	11Z,OZ3	23	D02	I/O	11Z,OZ3
24	WP	O	OT3	24	-IOIS16	O	OT3	24	-IOCS16	O	ON3
25	-CD2	O	Ground	25	-CD2	O	Ground	25	-CD2	O	Ground
26	-CD1	O	Ground	26	-CD1	O	Ground	26	-CD1	O	Ground
27	D11[1]	I/O	11Z,OZ3	27	D11[1]	I/O	11Z,OZ3	27	D11[1]	I/O	11Z,OZ3
28	D12[1]	I/O	11Z,OZ3	28	D12[1]	I/O	11Z,OZ3	28	D12[1]	I/O	11Z,OZ3
29	D13[1]	I/O	11Z,OZ3	29	D13[1]	I/O	11Z,OZ3	29	D13[1]	I/O	11Z,OZ3
30	D14[1]	I/O	11Z,OZ3	30	D14[1]	I/O	11Z,OZ3	30	D14[1]	I/O	11Z,OZ3
31	D15[1]	I/O	11Z,OZ3	31	D15[1]	I/O	11Z,OZ3	31	D15[1]	I/O	11Z,OZ3
32	-CE2[1]	I	13U	32	-CE2[1]	I	13U	32	-CS1[1]	I	13Z
33	-VS1	O	Ground	33	-VS1	O	Ground	33	-VS1	O	Ground

PC Card Memory Mode				PC Card I/O Mode				True IDE Mode[4]			
Pin No.	Signal Name	Pin Type	In, Out Type	Pin No.	Signal Name	Pin Type	In, Out Type	Pin No.	Signal Name	Pin Type	In, Out Type
34	-IORD	I	13U	34	-IORD	I	13U	34	-IORD[7] HSTROBE[8] -HDMARDY[9]	I	13Z
35	-IOWR	I	13U	35	-IOWR	I	13U	35	-IOWR[7] STOP[8.9]	I	13Z
36	-WE	I	13U	36	-WE	I	13U	36	-WE[3]	I	13U
37	READY	O	OT1	37	-IREQ	O	OT1	37	INTRQ	O	OZ1
38	VCC		Power	38	VCC		Power	38	VCC		Power
39	-CSEL[5]	I	12Z	39	-CSEL[5]	I	12Z	39	-CSEL	I	12U
40	-VS2	O	OPEN	40	-VS2	O	OPEN	40	-VS2	O	OPEN
41	RESET	I	12Z	41	RESET	I	12Z	41	-RESET	I	12Z
42	-WAIT	O	OT1	42	-WAIT	O	OT1	42	IORDY[7] -DDMARDY[8] DSTROBE[9]	O	ON1
43	-INPACK	O	OT1	43	-INPACK	O	OT1	43	DMARQ	O	OZ1
44	-REG	I	13U	44	-REG	I	13U	44	-DMACK[6]	I	13U
45	BVD2	O	OT1	45	-SPKR	O	OT1	45	-DASP	I/O	11U,ON1
46	BVD1	O	OT1	46	-STSCHG	O	OT1	46	-PDIAG	I/O	11U.ON1
47	D08[1]	I/O	11Z,OZ3	47	D08[1]	I/O	11Z,OZ3	47	D08[1]	I/O	11Z,OZ3
48	D09[1]	I/O	11Z,OZ3	48	D09[1]	I/O	11Z,OZ3	48	D09[1]	I/O	11Z,OZ3
49	D10[1]	I/O	11Z,OZ3	49	D10[1]	I/O	11Z,OZ3	49	D10[1]	I/O	11Z,OZ3
50	GND		Ground	50	GND		Ground	50	GND		Ground

Appendix A: Limited Warranty

APRO warrants your SLC Industrial Write-Protection CompactFlash® Card HERMIT-A Series 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**

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