APRO Co., Ltd.

Industrial

Semi Metal USB

Generation 5

HERCULES-PB Series

Product Specification

INDUSTRIAL

Semi Metal USB Flash Disk Generation 5

Version 01V0

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Revision History

Revision	Description	Date
1.0	Initial release	2016/07/01

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APRO Semi Metal USB Flash Disk – Generation 5 – HERCULES-PB Series © 2016 APRO Co., Ltd.

1. Introduction

APRO Industrial Semi Metal USB Flash Disk Generation 5 – HERCULES-PB Series, is specified as 2.0 High Speed Device, Mass Storage Class; USB-IF (USB Implementers Forum), WHQL (Window Hardware Quality Labs), EMI tests certified. In addition to being as a removable storage device, MUFD - Generation 5 can also be configured as a bootable disk for system recovery. Also, its random access performance exceed the minimum requirement of Read Boost feature found in Microsoft Vista operating system, in which randomly access blocks of information are saved into MUFD - Generation 5 for boosting up the average performance. They are available in 128MB, 256MB, 512MB, 1GB, 2GB, 4GB, 8GB and 16GB capacities by Toshiba SLC Flash IC..

Semi Metal USB - Generation 5 – HERCULES-PB Series also offers unique customization for OEM customers by laser carvings.

1.1. *Scope*

This document describes the key features and specifications of Semi Metal USB – Generation 5 – HERCULES-PB Series.

1.2. *System Features*

- USB 2.0 interface downwards compatible to USB 1.1
- USB 2.0 Mass Storage compliant
- LED indicator for the usage status of USB Flash Disk
- Standard grade operating temperature 0°C to 70°C, and Industrial Grade, -40°C to +85°C
- Support partition management for Disk Lock and Password Protection
- Supports Ready Boost for Microsoft Vista O.S.
- Capacities from 128MB to 16GB

1.3. *Flash Management Technology - Static Wear Leveling*

In order to gain the best management for flash memory, APRO Semi Metal USB HERCULES-PB 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.

1.4. System Environmental Specifications

Table 1: Environmental Specification

APRO Semi Metal USB Flash Disk HERCULES-PB Series		Standard Grade	Industrial Grade
		SMUFDxxxG-MPBTC-5	WMUFDxxxG-MPBTI-5
Temperature	Operating: Non-operating:	0ºC ~ +70ºC -20ºC ~ +80ºC	-40ºC ~ +85ºC -50ºC ~ +95ºC
Humidity	Operating & Non-operating:	85% / 95% RH None-Operating	
Vibration	Operating & Non-operating:	70 Hz to 2K Hz, 15G, 3 axes	
Shock	Operating & Non-operating:	0.5ms, 1500 G, 3 axes	

1.5. System Power Requirements

Table 2: Power Requirement

APRO Semi Metal USB Flash Disk HERCULES-PB Series		Power Consumption
DC Input Voltage.		5V±10%
+5V Current (Maximum average value)	Reading Mode :	120 (max.)
	Writing Mode :	139 (max.)
	Idle Mode :	75 (max.)

1.6. System Performance

Table 3: System Performances

Data Transfer Mode supporting		USB 2.0							
Average Access Time		0.6 ms (estimated)							
Maximum Performance	Capacity	128MB	256MB	512MB	1GB	2GB	4GB	8GB	16GB
	Sequential Read (MB/s)	25.7	25.8	25.7	25.8	25.9	27.4	27.5	27.5
	Sequential Write(MB/s)	20.0	20.0	20.2	20.1	21.0	23.0	23.9	23.9

Note:

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

(2). Testing of the Semi Metal USB Flash Disk maximum performance was performed under the following platform:

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

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1.7. *System Reliability*

Table 4: System Reliability

Wear-leveling Algorithms	Static Wear-leveling
Bad Blocks Management	Supportive
ECC Technology	72 bits per 1024 bytes
Endurance	Un-limited Read Cycles Endurance Management enables five years minimal useful life
Data Retention	10 years

1.8. *Physical Specifications*

Refer to Table 5 and see Figure 1 for Semi Metal USB Flash Disk HERCULES-PB Series physical specifications and dimensions.

Table 5: Physical Specifications

Length:	47.20 mm
Width:	17.20 mm
Thickness:	7.80 mm
Weight:	15 g / 0.53 oz

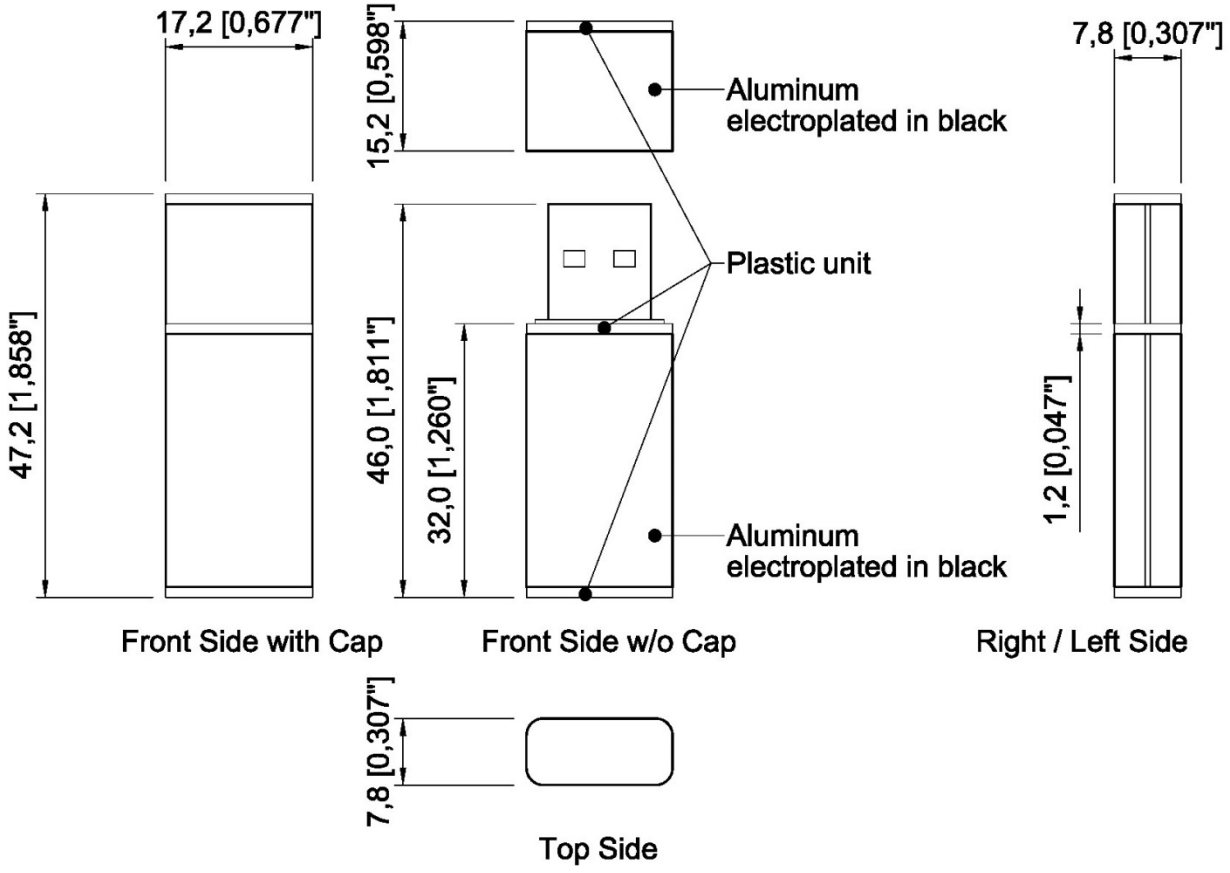

Figure 1: APRO Semi Metal USB Flash Disk Generation 5 Dimension

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1.8.1. *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. Interface Description

2.1. *APRO Semi Metal USB Flash Disk interface*

APRO Semi Metal USB Flash Disk is equipped with standard USB Type A connector.

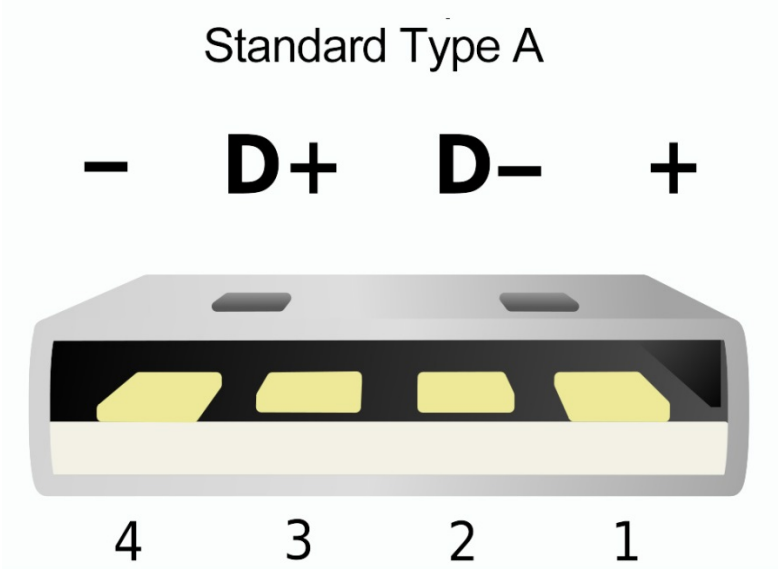

Figure 2: USB Type A Connector

2.2. *Pin Assignments*

There are total of 4 pins in the USB Type A Connector. The pin assignments are listed in below table 6.

Table 6 - Pin Assignments

Pin Number	Pin Name	Function
Pin 1	Vcc	Power
Pin 2	USB -	The pairs are used to transmit Address, Data and Command.
Pin 3	USB +	
Pin 4	Vss	Ground

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Appendix A: Ordering Information

1. Part Number List

◆ **APRO Semi Metal USB Flash Disk Generation 5 – HERCULES-PB Series**

Product Picture	*Grade*	*Standard grade (0ºC ~ 70ºC)*	*Industrial Grade (-40ºC ~ +85ºC)*
	*128MB*	SMUFD128M-MPBTC-5(/C)	WMUFD128M-MPBTI-5(/C)
	256MB	SMUFD256M-MPBTC-5(/C)	WMUFD256M-MPBTI-5(/C)
	512MB	SMUFD512M-MPBTC-5(/C)	WMUFD512M-MPBTI-5(/C)
	1GB	SMUFD001G-MPBTC-5(/C)	WMUFD001G-MPBTI-5(/C)
	2GB	SMUFD002G-MPBTC-5(/C)	WMUFD002G-MPBTI-5(/C)
	4GB	SMUFD004G-MPBTC-5(/C)	WMUFD004G-MPBTI-5(/C)
	8GB	SMUFD008G-MPBTC-5(/C)	WMUFD008G-MPBTI-5(/C)
	16GB	SMUFD016G-MPBTC-5(/C)	WMUFD016G-MPBTI-5(/C)

2. Part Number Decoder:

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

X1 : **Grade**

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

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

X2 : **The material of case**

M : Semi Metal

X3 X4 X5 : **Product category**

UFD : USB Flash Disk

X6 X7 X8 X9 : **Capacity**

128M:	128MB	**002G:**	2GB
256M:	256MB	**004G:**	4GB
512M:	512MB	**008G:**	8GB
001G:	1GB	**016G**	16GB

X11 : **Controller**

M : HERCULES Series

X12 X13 : Controller version
A, B, C….., PB,…

X14 : **Flash IC**

T : Toshiba SLC-NAND Flash IC

X15 : **Flash IC grade / Type**

C : Commercial grade

I : Industrial grade

Z1 : **Housing Generation**

5 : Generation 5 Housing

C : **Reserved for specific requirement**

C : Conformal-coating (option)

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Appendix B: Limited Warranty

APRO warrants your Semi Metal USB Flash Disk 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.