MLC

Semi Metal USB

Generation 4 / 4SB

HERCULES-PB Series

Product Specification

MLC

Rugged Metal USB Flash Disk Generation 4/4SB

Revision History

Revision	Description	Date
1.0	Initial release	2016/05/20

Contents

     APRO Rugged Metal USB Flash Disk – Generation 4/4SB – HERCULES-PB Series © 2016 APRO Co., Ltd.

1. Introduction

APRO MLC Rugged Metal USB Flash Disk Generation 4/4SB – 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, RUFD - Generation 4/4SB 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 RUFD - Generation 4/4SB for boosting up the average performance. Capacities are available for 4GB, 8GB, 16GB, 32GB and 64GB.

Rugged Metal USB - Generation 4/4SB – 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 Rugged Metal USB – Generation 4/4SB – 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
- ECC engine with correction capability up to 72-bit per 1024 bytes.
- Standard grade supports 0°C to 70°C, and Wide temp grade with conformal coating supports -40°C to +85°C
- Supports Ready Boost for Microsoft Win8, 7, and Vista O.S.
- Capacities are available for 4GB, 8GB, 16GB, 32GB and 64GB.

1.3. Flash Management Technology - Static Wear Leveling

In order to gain the best management for flash memory, APRO Rugged 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.

2.1. System Environmental Specifications

Table 1: Environmental Specification

APRO Rugged Metal USB Flash Disk HERCULES-PB Series		Standard Grade SRUFDxxxG-MPBTMB-4(4SB)	Wide Temp Grade WRUFDxxxG-MPBTMB-4(4SB)C
Temperature	Operating:	0ºC ~ +70ºC	-40ºC ~ +85ºC
	Non-operating:	-20ºC ~ +80ºC	-40ºC ~ +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	

2.2. System Power Requirements

Table 2: Power Requirement

APRO Rugged Metal USB Flash Disk HERCULES-PB Series		
DC Input Voltage (VCC)		5V±10%
+5V Current (Maximum average value)	Reading Mode :	81.9 (64GB max.)
	Writing Mode :	103.0 (64GB max.)
	Idle Mode :	60.9 (64GB max.)

2.3. System Performance

Table 3: System Performances

Data Transfer Mode supporting		USB 2.0				
Average Access Time		0.5 ms (estimated)				
Maximum Performance	Capacity	4GB	8GB	16GB	32GB	64GB
	Sequential Read (MB/s)	23.4	23.4	25.1	25.2	25.5
	Sequential Write(MB/s)	15.3	15.3	14.7	15.2	19.1

Note:

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

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

   - Computer with Intel i5 3.5GHz processor

   - Windows 7 Professional operating system

2.4. 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

2.5. Physical Specifications

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

Table 5: Physical Specifications of APRO Rugged Metal USB Flash Disk HERCULES-PB Series

Generation	G4	G4SB
Length:	54.80 mm	54.82 mm
Width:	15.80 mm	15.95 mm
Thickness:	15.80 mm	15.95 mm
Weight:	25 g / 0.88 oz	25 g / 0.88 oz
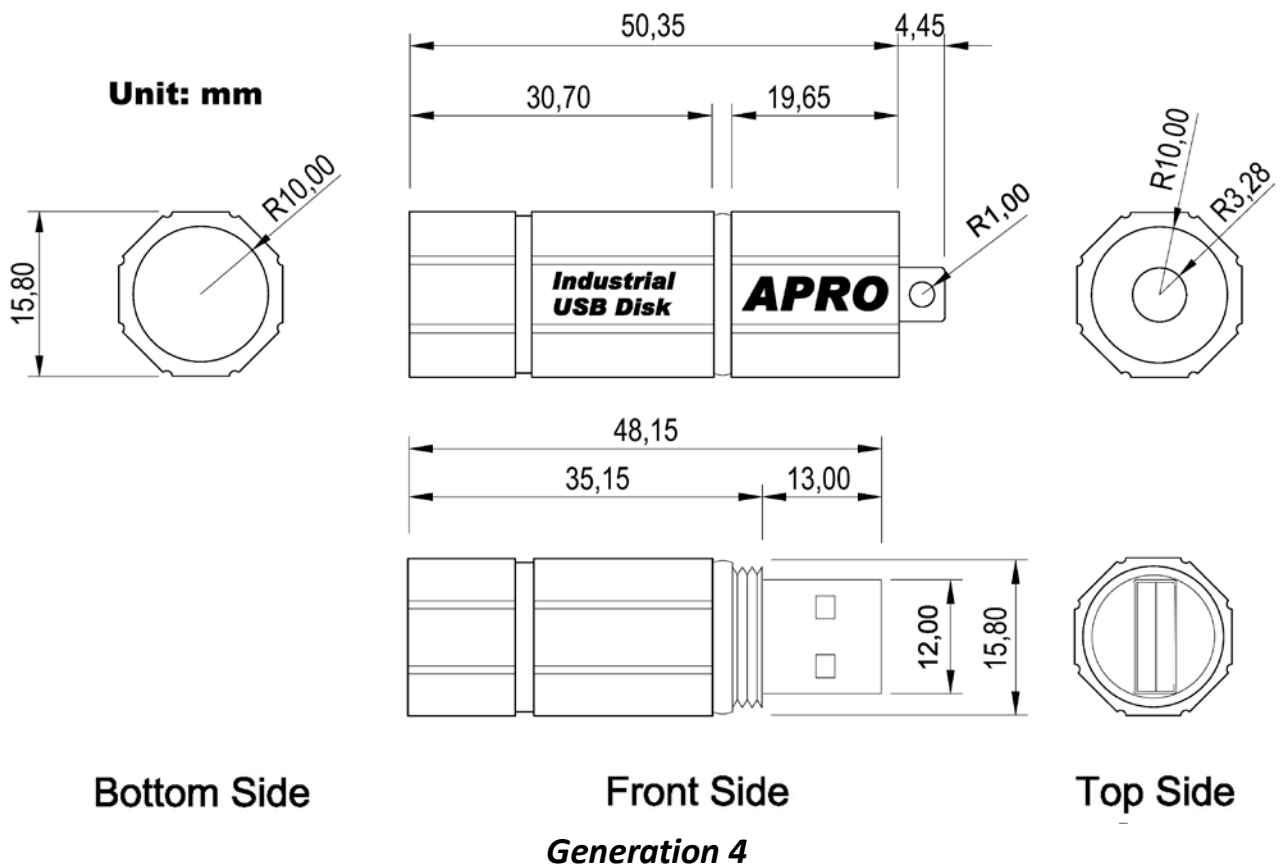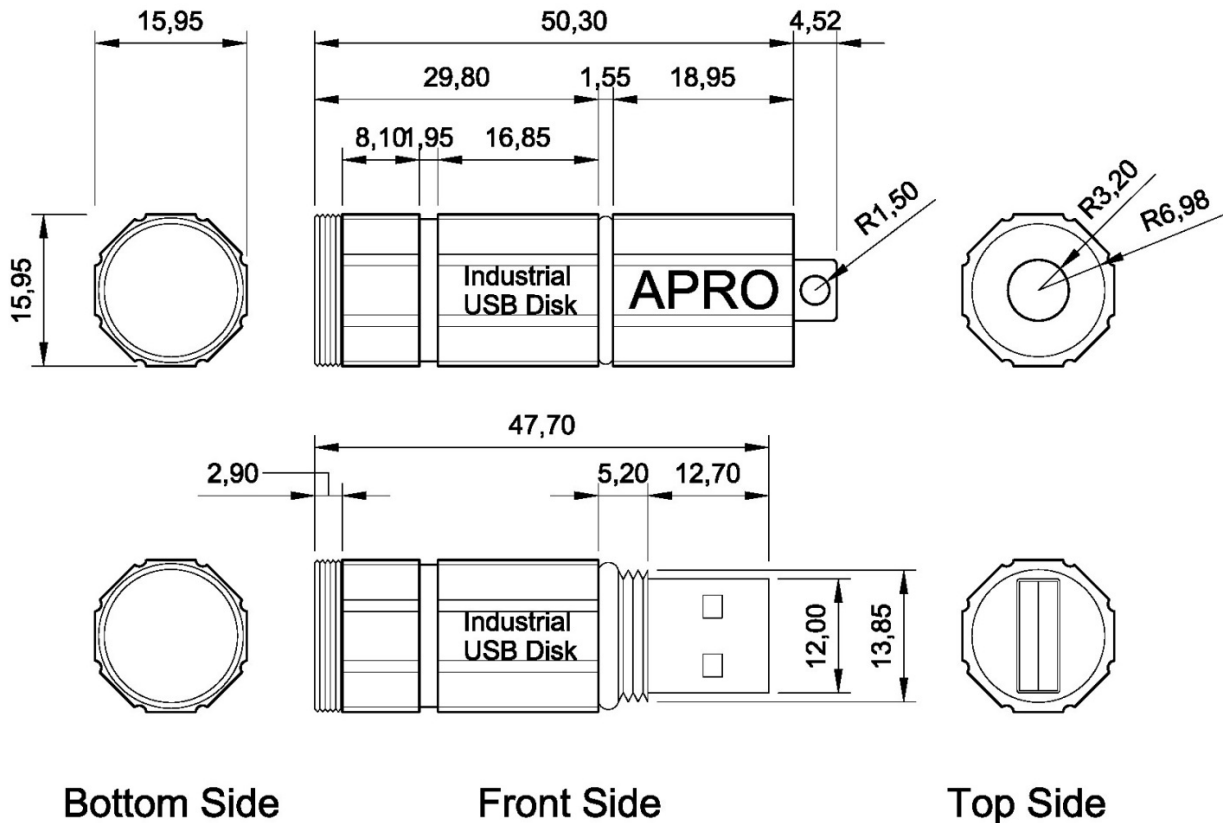
Generation 4

Generation 4SB

Figure 1: APRO Rugged Metal USB Flash Disk 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 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

3. Interface Description

3.1. APRO Rugged Metal USB Flash Disk interface

APRO Rugged Metal USB Flash Disk is equipped with standard USB Type A connector.
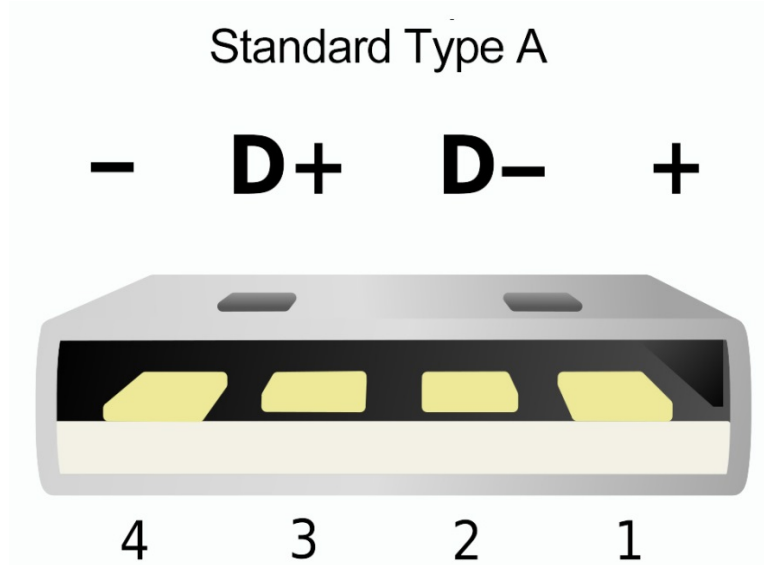
Figure 2: USB Type A Connector

3.2. 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
Pin 3	USB +	Address, Data and Command.
Pin 4	Vss	Ground

APRO Rugged Metal USB Flash Disk – Generation 4/4SB – HERCULES-PB Series © 2016 APRO Co., Ltd.

Appendix A: Ordering Information

1. **Part Number List**

◆ **APRO Rugged Metal USB Flash Disk Generation 4 – HERCULES-PB Series**

Product Picture	Grade	Standard grade (0ºC ~ 70ºC)	Wide Temp Grade (-40ºC ~ +85ºC)
	4GB	SRUFD004G-MPBTMB-4	WRUFD004G-MPBTMB-4C
	8GB	SRUFD008G-MPBTMB-4	WRUFD008G-MPBTMB-4C
	16GB	SRUFD016G-MPBTMB-4	WRUFD016G-MPBTMB-4C
	32GB	SRUFD032G-MPBTMB-4	WRUFD032G-MPBTMB-4C
	64GB	SRUFD064G-MPBTMB-4	WRUFD064G-MPBTMB-4C

◆ **APRO Rugged Metal USB Flash Disk Generation 4SB – HERCULES-PB Series**

Product Picture	Grade	Standard grade (0ºC ~ 70ºC)	Wide Temp Grade (-40ºC ~ +85ºC)
	4GB	SRUFD004G-MPBTMB-4SB	WRUFD004G-MPBTMB-4SBC
	8GB	SRUFD008G-MPBTMB-4SB	WRUFD008G-MPBTMB-4SBC
	16GB	SRUFD016G-MPBTMB-4SB	WRUFD016G-MPBTMB-4SBC
	32GB	SRUFD032G-MPBTMB-4SB	WRUFD032G-MPBTMB-4SBC
	64GB	SRUFD064G-MPBTMB-4SB	WRUFD064G-MPBTMB-4SBC

2. **Part Number Decoder:**

X1 X2 X3 X4 X5 X6 X7 X8 X9 — X11 X12 X13 X14 X15 X16 — Z1 — C

X1 : **Grade**

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

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

(Standard grade with conformal coating)

X2 : **The material of case**

R : Rugged Metal

X3 X4 X5 : **Product category**

UFD : USB Flash Disk

X6 X7 X8 X9 : **Capacity**

004G:	4GB	**064G:**	64GB
008G:	8GB		
016G:	16GB		
032G:	32GB		

X11 : **Controller**

M : HERCULES Series

X12 X13 : **Controller version**

A, B, C…..

X14 : **Flash IC**

T : Toshiba NAND Flash IC

X15 : **Flash IC grade / Type**

M : MLC-NAND Flash IC

X16 : **Generation**

B : 15 nm

Z1 : **Housing Generation**

4 : Generation 4 Housing

4SB : Generation 4SB Housing

Z2 : **Special Design**

S : Screw Thread

Z3 : **Special Design**

B : Black

C : **Reserved for specific requirement**

C : Conformal-coating

Appendix B: Limited Warranty

APRO warrants your Rugged 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.

- **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.