



MLC
Semi-Metal USB
Generation 3L
HERMIT-C Series

Product Specification

MLC

Semi-Metal USB Flash Disk Generation 3L

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Revision History

Revision	Description	Date
1.0	Initial release	2016/06/28

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1. Introduction

APRO MLC Semi-Metal USB Flash Disk Generation 3L – HERMIT-C Series, is specified as 2.0 High Speed Device, Mass Storage Class; USB-IF (USB Implementers Forum), WHQL (Window Hardware Quality Labs). In addition to being as a removable storage device, MUFD HERMIT-C Series can also be configured as a bootable disk for system recovery. Also, its random access performance exceed the minimum requirement of Windows/Linux/VxWorks/QNX Embedded operating system, in which randomly access blocks of information are saved into MUFD - Generation 3L for boosting up the average performance. They are available in 4GB, 8GB, 16GB, 32GB, 64GB and 128GB capacities by Toshiba 15-nm MLC Flash IC..

APRO MLC Semi-Metal USB - Generation 3L – HERMIT-C Series also offers unique customization for OEM customers by laser carvings.

1.1. Scope

This document describes the key features and specifications of MLC Semi-Metal USB – Generation 3L – HERMIT-C Series.

1.2. System Features

- Full metal enclosure design to endure various rough environments
- Ultra-high random read performance up to 4.9 MB/sec.(max)
- Ultra-high random write performance up to 3.7 MB/sec.(max)
- USB 2.0 Mass Storage compliant, and downwards compatible to USB 1.1
- Standard grade operating temperature 0°C to 70°C, and wide temperature Grade, -40°C to +85°C
- S.M.A.R.T. feature support
- Flexible 96-Bit/1KB BCH ECC engine
- Capacities from 4GB to 128GB

1.3. Flash Management Technology - Static Wear Leveling

In order to gain the best management for flash memory, APRO MLC Semi-Metal USB HERMIT-C 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 MLC Semi-Metal USB Flash Disk		Standard Grade	Wide Temp. Grade
HERMIT-C Series		SMUFDxxxG-HCCTMB-3L	WMUFDxxxG-HCCTMB-3L/C
Temperature	Operating:	0°C ~ +70°C	-40°C ~ +85°C
	Non-operating:	-20°C ~ +80°C	-50°C ~ +95°C
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 MLC Semi-Metal USB Flash Disk		Power Requirement
HERMIT-C Series		
DC Input Voltage (VCC)		5V±5%
+5V Current (Maximum average value)	Reading Mode :	75.5 (max.)
	Writing Mode :	92.6 (max.)
	Idle Mode :	37.9 (max.)

2.3. System Performance

Table 3: System Performances

Data Transfer Mode supporting		USB 2.0					
Average Access Time		1.9 ms (estimated)					
Maximum Performance (MB/s)	Capacity	4GB	8GB	16GB	32GB	64GB	128GB
	Sequential Read	20.1	20.6	20.8	24.0	24.7	25.0
	Sequential Write	13.6	13.6	12.0	19.4	20.0	19.0
	Random Read	4.9	4.9	4.9	4.9	4.9	4.7
	Random Write	3.6	3.7	3.4	3.5	3.5	3.3

Note:

(1). All values quoted are typically at 25 °C 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

2.4. System Reliability

Table 4: System Reliability

Wear-leveling Algorithms	Static Wear-leveling
Bad Blocks Management	Supportive
ECC Technology	96 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 Semi-Metal USB Flash Disk HERMIT-C Series physical specifications and dimensions.

Table 5: Physical Specifications

Length:	60.0 mm
Width:	17.6 mm
Thickness:	8.4 mm
Weight:	15 g / 0.53 oz

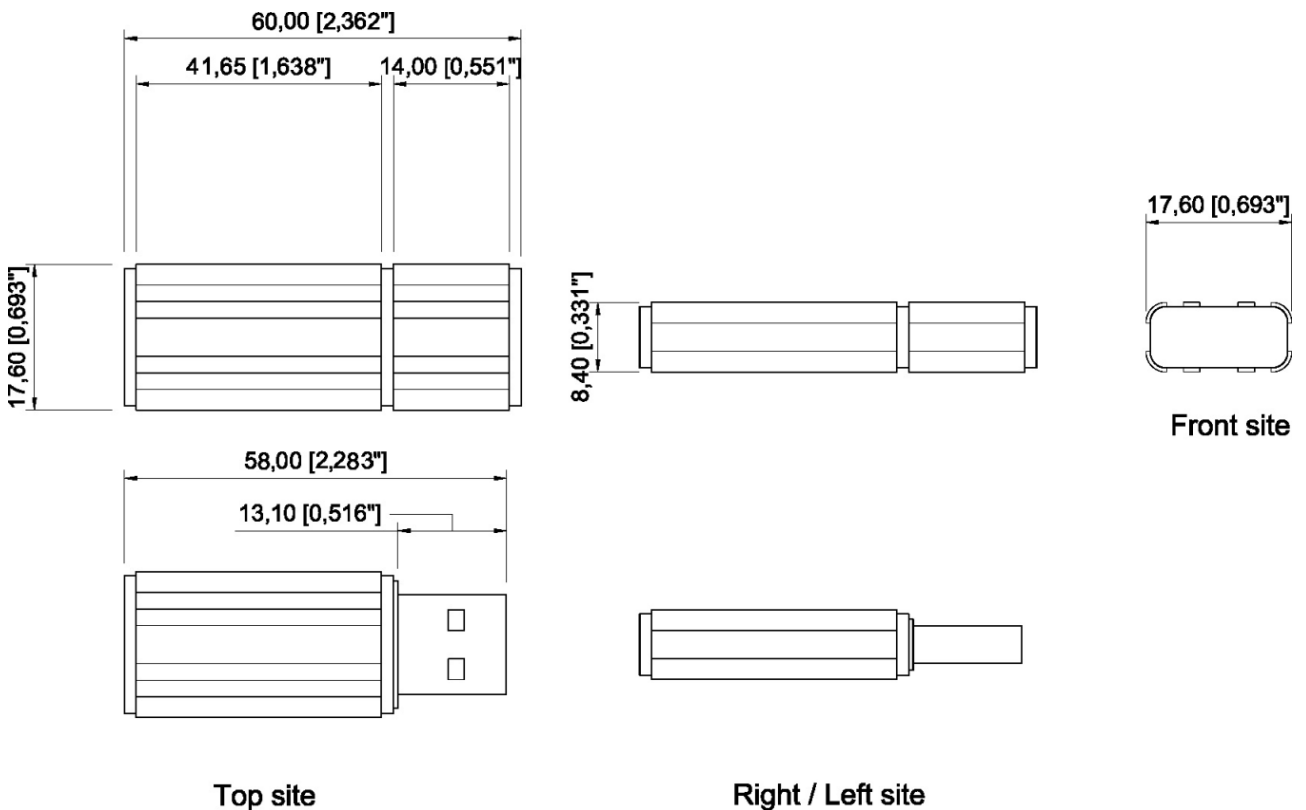


Figure 1: APRO MLC Semi-Metal USB Flash Disk Generation 3L Dimension

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

3. Interface Description

3.5. APRO MLC Semi-Metal USB Flash Disk interface

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

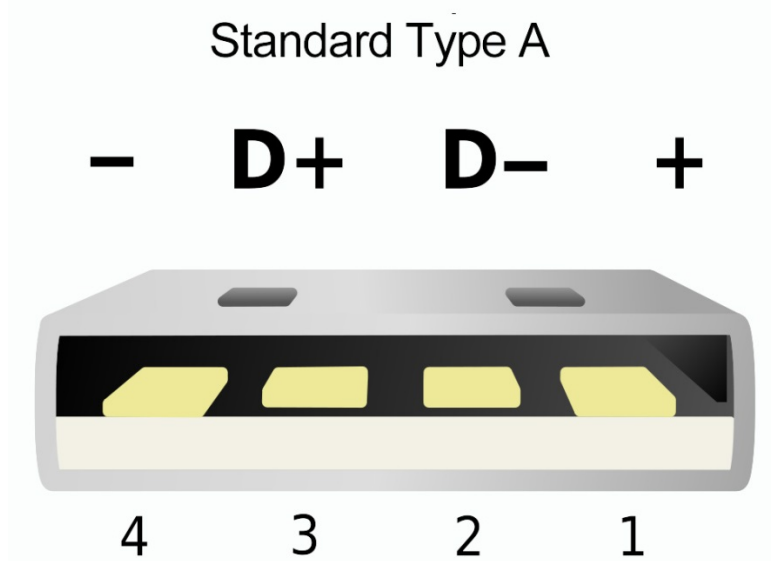


Figure 2: USB Type A Connector

3.6. 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

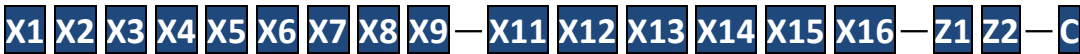
Appendix A: Ordering Information

1. Part Number List

◆ **APRO MLC Semi-Metal USB Flash Disk Generation 3L – HERMIT-C Series**

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Wide Temp. Grade (-40°C ~ +85°C)
	4GB	SMUFD004G-HCCTMB-3L(/C)	WMUFD004G-HCCTMB-3LC
	8GB	SMUFD008G-HCCTMB-3L(/C)	WMUFD008G-HCCTMB-3LC
	16GB	SMUFD016G-HCCTMB-3L(/C)	WMUFD016G-HCCTMB-3LC
	32GB	SMUFD032G-HCCTMB-3L(/C)	WMUFD032G-HCCTMB-3LC
	64GB	SMUFD064G-HCCTMB-3L(/C)	WMUFD064G-HCCTMB-3LC
	128GB	SMUFD128G-HCCTMB-3L(/C)	WMUFD128G-HCCTMB-3LC

2. Part Number Decoder:



X1 : Grade

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

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

X2 : The material of case

M : Semi-Metal

X3 X4 X5 : Product category

UFD : USB Flash Disk

X6 X7 X8 X9 : Capacity

004G:	4GB	128G	128GB
008G:	8GB		
016G	16GB		
032G	32GB		
064G	64GB		

X11 : Controller

H : HERMIT Series

X12 : Controller version

A, B, C.....

X13 : Controller Grade

C : Commercial grade

X14 : Flash IC

T : Toshiba MLC-NAND Flash IC

X15 X16 : Flash IC grade / Type

M : MLC grade

B : 15nm

Z1 Z2 : Housing Generation

3L : Generation 3L Housing

C : Reserved for specific requirement

C : Conformal-coating

Appendix B: Limited Warranty

APRO warrants your MLC 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:

- **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.