



# Industrial Semi-Metal USB

Generation 3L  
HERMIT-C Series

## **Product Specification**

INDUSTRIAL

Semi-Metal USB Flash Disk Generation 3L

Version 01V0

Document No. 100-xMUFD-HCT3L

December, 2015

**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.

© 2015 APRO Corporation. All rights reserved.

#### Revision History

Revision	Description	Date
1.0	Initial release	2015/12/21

# CONTENTS

<b>1. INTRODUCTION.....</b>	<b>- 2 -</b>
1.1. SCOPE.....	- 2 -
1.2. SYSTEM FEATURES.....	- 2 -
1.3. FLASH MANAGEMENT TECHNOLOGY - STATIC WEAR LEVELING .....	- 2 -
<b>2. PRODUCT SPECIFICATIONS.....</b>	<b>- 3 -</b>
2.1. SYSTEM ENVIRONMENTAL SPECIFICATIONS.....	- 3 -
2.2. SYSTEM POWER REQUIREMENTS .....	- 3 -
2.3. SYSTEM PERFORMANCE.....	- 3 -
2.4. SYSTEM RELIABILITY.....	- 4 -
2.5. PHYSICAL SPECIFICATIONS.....	- 4 -
2.5.1. CONFORMAL COATING.....	- 5 -
<b>3. INTERFACE DESCRIPTION.....</b>	<b>- 5 -</b>
3.1. APRO SEMI-METAL USB FLASH DISK INTERFACE .....	- 5 -
3.2. PIN ASSIGNMENTS.....	- 5 -
<b>APPENDIX A: ORDERING INFORMATION.....</b>	<b>- 6 -</b>
1. PART NUMBER LIST .....	- 6 -
2. PART NUMBER DECODER:.....	- 6 -
<b>APPENDIX B: LIMITED WARRANTY.....</b>	<b>7</b>

## 1. Introduction

APRO Industrial 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 128MB, 256MB, 512MB, 1GB, 2GB, 4GB, 8GB, 16GB and 32GB capacities by Toshiba SLC Flash IC..

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 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 4.9MB/sec.(max)
- Ultra-high random write performance up to 3.9MB/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 Industrial Grade, -40°C to +85°C
- S.M.A.R.T. feature support
- Flexible 96-Bit/1KB BCH ECC engine
- Capacities from 128MB to 32GB
- Certifications and Declarations
  - Certifications: CE & FCC
  - Declarations: RoHS2 & REACH

### 1.3. Flash Management Technology - Static Wear Leveling

In order to gain the best management for flash memory, APRO 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 Semi-Metal USB Flash Disk HERMIT-C Series		Standard Grade SMUFDxxxG-HCCTC-3L	Industrial Grade WMUFDxxxG-HCITI-3L
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 Semi-Metal USB Flash Disk HERMIT-C Series DC Input Voltage (VCC)		Power Requirement
		5V±10%
+5V Current (Maximum average value)	Reading Mode :	77.2 (max.)
	Writing Mode :	83.4 (max.)
	Idle Mode :	35.2 (max.)

### 2.3. System Performance

Table 3: System Performances

Data Transfer Mode supporting		USB 2.0								
Average Access Time		1.1 ms (estimated)								
Maximum Performance (MB/s)	Capacity	128MB	256MB	512MB	1GB	2GB	4GB	8GB	16GB	32GB
	Sequential Read	9.6	TBC	18.1	22.5	22.6	22.6	25.2	25.4	25.5
	Sequential Write	4.9	TBC	14.5	12.8	12.7	13.2	18.2	18.0	18.5
	Random Read	3.4	TBC	4.6	4.3	3.9	3.7	4.8	4.9	4.9
	Random Write	1.6	TBC	3.4	3.1	2.9	3.0	3.8	3.9	3.9

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**

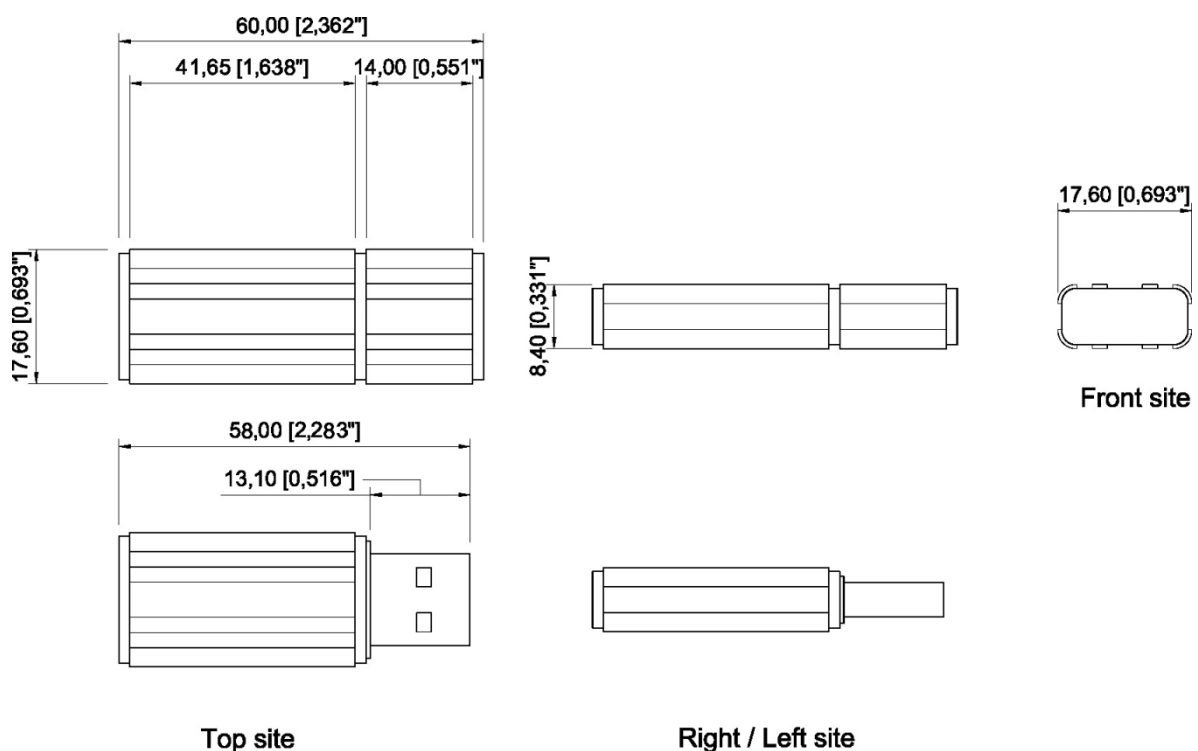
<b>Wear-leveling Algorithms</b>	Static Wear-leveling
<b>Bad Blocks Management</b>	Supportive
<b>ECC Technology</b>	96 bits per 1024 bytes
<b>Endurance</b>	Un-limited Read Cycles Endurance Management enables five years minimal useful life
<b>Data Retention</b>	10 years

## 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 of APRO Semi-Metal USB Flash Disk HERMIT-C Series**

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



**Figure 1: APRO 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 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 Semi-Metal USB Flash Disk interface

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

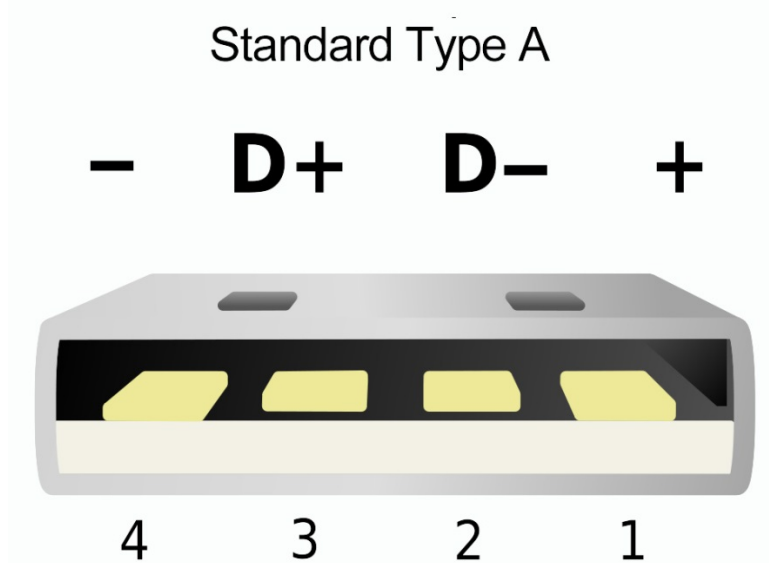


Figure 2: USB Type A Connector

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

**Appendix A: Ordering Information**

**1. Part Number List**

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

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Industrial Grade ( -40°C ~ +85°C )
	<b>128MB</b>	SMUFD128M-HCCTC-3L(/C)	WMUFD128M-HCITI-3L(/C)
	<b>256MB</b>	SMUFD256M-HCCTC-3L(/C)	WMUFD256M-HCITI-3L(/C)
	<b>512MB</b>	SMUFD512M-HCCTC-3L(/C)	WMUFD512M-HCITI-3L(/C)
	<b>1GB</b>	SMUFD001G-HCCTC-3L(/C)	WMUFD001G-HCITI-3L(/C)
	<b>2GB</b>	SMUFD002G-HCCTC-3L(/C)	WMUFD002G-HCITI-3L(/C)
	<b>4GB</b>	SMUFD004G-HCCTC-3L(/C)	WMUFD004G-HCITI-3L(/C)
	<b>8GB</b>	SMUFD008G-HCCTC-3L(/C)	WMUFD008G-HCITI-3L(/C)
	<b>16GB</b>	SMUFD016G-HCCTC-3L(/C)	WMUFD016G-HCITI-3L(/C)
	<b>32GB</b>	SMUFD032G-HCCTC-3L(/C)	WMUFD032G-HCITI-3L(/C)

**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  
**I:** Industrial 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**

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

**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

**Z1 Z2 : Housing Generation**

**3L :** Generation 3L Housing

**C : Reserved for specific requirement**

**C :** Conformal-coating



**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:**

- SMUFDxxxx-HCCTC-3L(/C)      3 years



- WMUFDxxxx-HCITI-3L(/C)      5 years



*The warranty period is able to extend. Please contact APRO and/or Your APRO distributors for more information.*