APRO Co., Ltd.

3D NAND TLC Flash

(KIOXIA BiCS5 3D NAND) / (3D aSLC Mode)

PHANES-S Series

USB 3.2 Flash Disk

Document No. : 100-SMUFD-PSCT5X-G6

Version No. : 02V1

Date : October, 2023

ISO 9001 : 2015 CERTIFIED

Product Features

- **Flash IC**
  - Kioxia **BiCS-5** 3D-TLC
  - Kioxia **BiCS FLASH™ *3**
  - Kioxia BiCS5 3D-NAND Flash w/aSLC Technology.

- **Compatibility**
  - Fully compatible with USB Specification Version 3.2 gen 1, and backward compatible with USB 3.1, 2.0 & 1.1
  - Support Windows Vista, Windows XP, Windows 7, Windows 8 and Windows 10 without device driver.
  - Support MAC OS X and later without device driver. (USB 1.1 speed)
  - Support MAC OS 10.2.8 and later without device driver. (USB 2.0 speed)
  - Support MAC OS 10.8 and later without device driver. (USB 3.2 GEN 1 speed)
  - Support Linux Kernel ver. 2.4.0 or above without device driver. (USB 1.1 speed)
  - Support Linux Kernel ver. 2.4.10 or above without device driver. (USB 2.0 speed)

- **Additional Capabilities *1**
  - S.M.A.R.T.*1 (Self-Monitoring, Analysis and Reporting Technology) feature set support.
  - Low power consumption.
  - Support Static/Dynamic Wear-Leveling algorithm.
  - Red LED status indicator at the bottom cap :

    Ready mode: LED standby w/o flashing.

    Working mode: Red LED flashing

- **Mechanical**
  - Semi-metal casing
  - USB 3.2 standard A interface
  - Dimension: 59.19 mm x 17.47 mm x 7.98 mm.
  - Weight: 9.00 g / 0.31 oz.

- **Power**
  - Operating Voltage 5V (+/-) 10%
  - Read Mode: 196.3 mA (max.)
  - Write Mode: 188.4 mA (max.)
  - Suspend Mode: 1.2 mA (max.)
  - Normal: 70.6 mA (max.)

- **Performance (Maximum value) *2**
  - **3D NAND**
  - Sequential Read: 210.0 MB/sec. (max.)
  - Sequential Write: 100.0 MB/sec. (max.)
  - **3D aSLC**
  - Sequential Read: 240.0 MB/sec. (max.)
  - Sequential Write: 120.0 MB/sec. (max.)

- **Capacity**
  - **3D NAND** : 64GB, 128GB, 256GB, 512GB.
  - **3D aSLC :** 16GB, 32GB, 64GB, 128GB

- **Reliability**
  - **ECC:** LDPC ECC engine embedded
  - **Temperature:** (Operating)

    Standard Grade: 0ºC ~ +70ºC

- **Certifications and Declarations**
  - **Certifications**: CE & FCC
  - **Declarations**: RoHS2 & REACH

Remarks:

1. Support official S.M.A.R.T. Utility.
2. Sequential performance is based on CrystalDiskMark 5.1.2 with file size 1000MB
3. **BiCS** means Bit Cost Scalable Technology.

   BiCS FLASH is a trademark of KIOXIA Corporation.

Order Information

I. Part Number List

◆ **APRO Kioxia BiCS-5 3D-NAND USB3.2 Flash Disk PHANES-S Series**

Product Picture	Capacity	Standard grade (0ºC ~ 70ºC)
	64GB	SMUFD064G-PSCT5-6
	128GB	SMUFD128G-PSCT5-6
	256GB	SMUFD256G-PSCT5-6
	512GB	SMUFD512G-PSCT5-6

◆ **APRO Kioxia BiCS-5 3D-aSLC USB3.2 Flash Disk PHANES-S Series**

Product Picture	Capacity	Standard grade (0ºC ~ 70ºC)
	16GB	SMUFD016G-PSCT5AS-6
	32GB	SMUFD032G-PSCT5AS-6
	64GB	SMUFD064G-PSCT5AS-6
	128GB	SMUFD128G-PSCT5AS-6

II. Part Number Decoder:

X1 X2 X3 X4 X5 X6 X7 X8 X9 – X11 X12 X13 X14 X15 – X17

X1 : **Grade**

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

X2 : **The material of case**

M : Semi-metal

X3 X4 X5 : **Product category**

UFD : USB Flash Disk

X6 X7 X8 X9 : **Capacity**

016G:	16GB	**128G:**	128GB
032G:	32GB	**256G:**	256GB
064G:	64GB	**512G:**	512GB

X11 : **Controller**

P : PHANES Series

X12 : **Controller version**

R : PHISON 2251-11

X13 : **Controller Grade**

C : Commercial grade

X14 : **Flash IC**

T : KIOXIA NAND Flash IC

X15 : **Flash IC grade / Type**

5 : KIOXIA BiCS5 3D-NAND Flash IC.

AS : KIOXIA 3D NAND Flash IC w/aSLC Technology.

X17 : **Casing Generation**

6 : G6 Housing

Revision History

Revision	Description	Date
1.0	Initial release.	2023/07/11
2.0	Add. 3D aSLC solution	2023/09/18
2.1	Add. 3D NAND 512GB Add. 3D aSLC 128GB	2023/10/17

Contents

1. Introduction

APRO Kioxia BiCS-5 3D-NAND USB3.2 Flash Disk PHANES-S Series is a super speed USB 3.2 GEN 1 removable flash disk drive with USB 3.2 GEN 1 connection (backward compatible with USB 2.0/1.1) and supports various storage capacities.

APRO Kioxia BiCS-5 3D-NAND/3D aSLC USB3.2 Flash Disk PHANES-S Series is compatible with all USB specification (USB 1.1 / USB 2.0 / USB 3.2 GEN 1). It is a plug and play device, simply plug it into any USB port and it will automatically get detected by the computer. Now you can read, write, copy, delete and move data from your hard disk drive to the UFD or from UFD to your hard disk drive with the super speed of USB 3.2 GEN 1.

APRO Kioxia BiCS-5 USB3.2 Flash Disk PHANES-S Series is so compact that you can take it with you anywhere in your pocket. With the high capacity of APRO Kioxia BiCS-5 USB3.2 Flash Disk PHANES-S Series, you can use it as an external removable hard drive. Now, you don't have to carry a laptop computer with you to work if you have access to a computer. "Bring your data only." Moreover, APRO Kioxia BiCS-5 USB3.2 Flash Disk PHANES-S Series does not require any battery, cables or software drivers. It is compatible with any desktop or notebook computers with USB port. Experience the light weighted, compact design, super performance and fast data transfer with APRO Kioxia BiCS-5 USB3.2 Flash Disk PHANES-S Series.

APRO Kioxia BiCS-5 USB3.2 Flash Disk PHANES-S Series also offers unique customization for OEM customers by laser carvings.

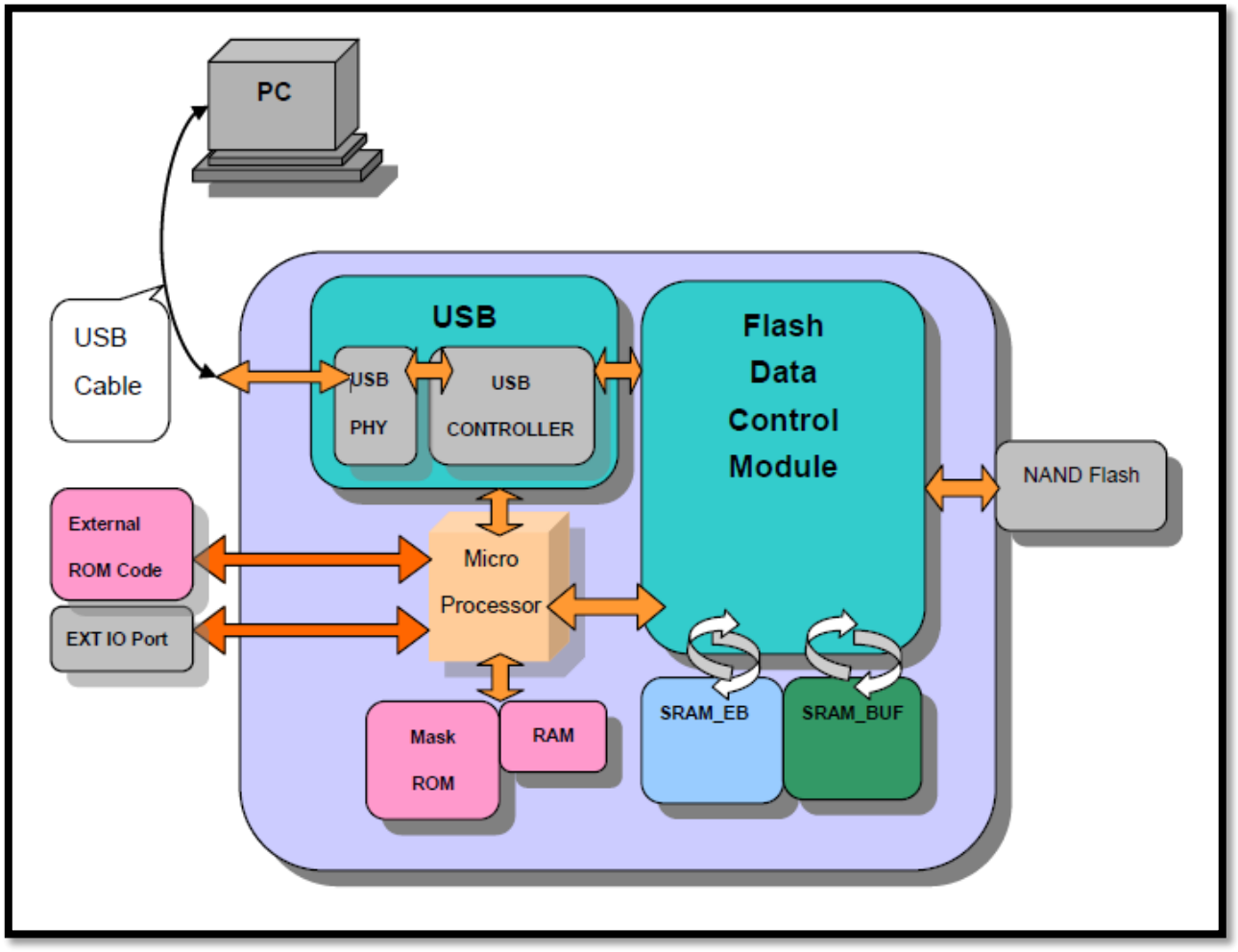


Figure 1: APRO Kioxia BiCS-5 3D-NAND USB3.2 Flash Disk PHANES-S Series controller block diagram

1.1. *Scope*

This document describes features, specifications and installation guide of A APRO Kioxia BiCS-5 3D-NAND USB3.2 Flash Disk PHANES-S Series. In the appendix, there provides order information, warranty policy, RMA/DOA procedure for the most convenient reference.

1.2. *Flash Management Technology – Static & Dynamic Wear Leveling*

NAND flash devices can only undergo a limited number of program/erase cycles, and in most cases, the flash media are not used evenly. If some areas get updated more frequently than others, the lifetime of the device would be reduced significantly. Thus, Wear Leveling is applied to extend the lifespan of NAND Flash by evenly distributing write and erase cycles across the media.

An APRO Kioxia BiCS-5 USB3.2 Flash Disk PHANES-S Series provides advanced Wear Leveling algorithm, which can efficiently spread out the flash usage through the whole flash media area. Moreover, by implementing both dynamic and static Wear Leveling algorithms, the life expectancy of the NAND flash is greatly improved.

1.3. *Host Operating System support ability*

- Support Windows Vista, Windows XP, Windows 7, Windows 8 and Windows 10 without device driver.
- Support MAC OS 10.2.8 and later without device driver. (USB 2.0 speed)
- Support MAC OS 10.8 and later without device driver. (USB 3.2 GEN 1 speed)
- Support Linux Kernel ver 2.4.0 or above without device driver. (USB 1.1 speed)
- Support Linux Kernel ver 2.4.10 or above without device driver. (USB 2.0 speed)

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 Kioxia BiCS-5 3D-NAND USB3.2 Flash Disk PHANES-S Series		Standard Grade
Temperature	**Operating:**	0ºC ~ +70ºC
	Non-operating:	-20ºC ~ +80ºC
Humidity	**Operating & Non-operating:**	20% to 90% RH

2.2. *System Power Requirements*

Table 2: Power Requirement

APRO Kioxia BiCS-5 3D-NAND USB3.2 Flash Disk PHANES-S Series			
DC Input Voltage (VCC)		5V±10%	
		3D-NAND	3D-aSLC
Maximum average value	**Reading Mode :**	196.3 mA (max.)	192.1 mA (max.)
	Writing Mode :	188.4 mA (max.)	187.9 mA (max.)
	Suspend Mode :	1.2 mA (max.)	0.9 mA (max.)
	Normal :	70.6 mA (max.)	68.3 mA (max.)

2.3. *System Performance*

Table 3: System Performances

Data Transfer Mode supporting		USB 3.2 GEN 1 speed			
Maximum Performance	**3D-NAND**	**64GB**	**128GB**	**256GB**	**512GB**
	Sequential Read (MB/s)	180.0	210.0	210.0	210.0
	Sequential Write (MB/s)	30.0	100.0	100.0	100.0
	3D-aSLC	**16GB**	**32GB**	**64GB**	**128GB**
	Sequential Read (MB/s)	240.0	240.0	240.0	240.0
	Sequential Write (MB/s)	50.0	50.0	120.0	120.0

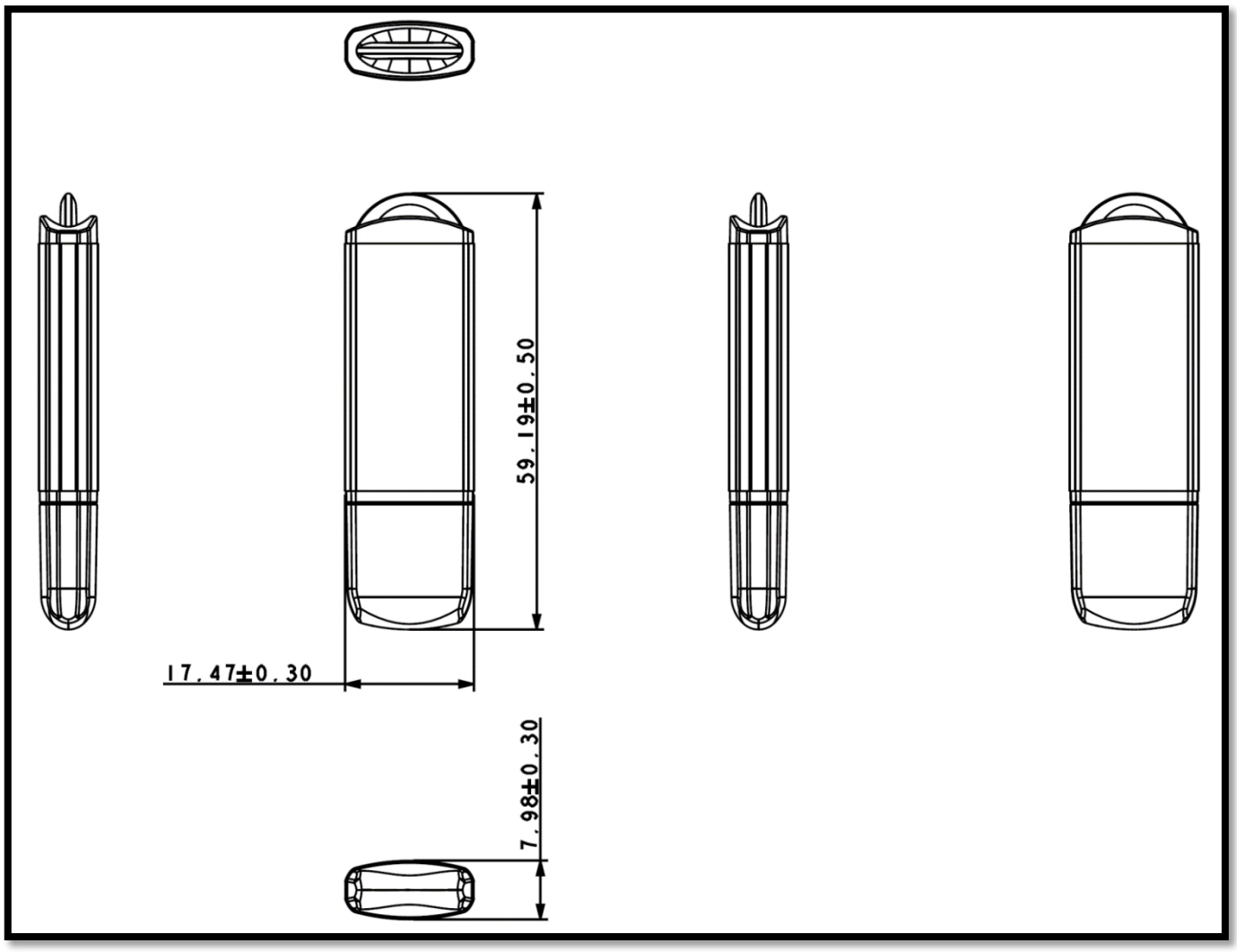
Note: *Performance based on flash mode Toggle 2.0.*

2.4. *Physical Specifications*

Refer to Table 5 and see Figure 2 for APRO Kioxia BiCS-5 3D-NAND/3D aSLC USB3.2 Flash Disk PHANES-S Series physical specifications and dimensions.

Table 5: Physical Specifications

Length:	59.19 mm (+/- 0.5)
Width:	17.47 mm (+/- 0.3)
Thickness:	7.98 mm (+/- 0.3)
Weight:	9.0 g / 0.31 oz.



3. Interface Description

3.1. APRO USB 3.2 Flash Disk Type A male interface

APRO Kioxia BiCS-5 USB3.2 Flash Disk PHANES-S Series is equipped with standard 9 pins USB 3.2 Type A male connector.

Figure 3: The Type A male connector of APRO USB 3.2 Flash Disk

3.2. Pin Assignments

There are total of 9 pins in the signal segment. The pin assignments are listed in below table 6.

Table 6 - Pin Assignments

Name	Type	Description
1	**VBUS**	Power
2	**D-**	USB2.0 Differential Pair
3	**D+**	
4	**GND**	Ground for power return
5	**StdA_SSRX-**	Super-speed receiver differential pair
6	**StdA_SSRX+**	
7	**GND_DRAIN**	Ground for signal return
8	**StdA_SSTX-**	Super-speed transmitter differential pair
9	**StdA_SSTX+**	

Appendix A: Limited Warranty

APRO warrants your 3D-NAND USB3.2 Flash Disk PHANES-S 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:

- **3D-NAND TLC (Standard Grade** 0ºC ~ +70ºC **) 2 years / Within 3K Erasing Counts**
- **3D-aSLC (Standard Grade** 0ºC ~ +70ºC **) 2 years / Within 30K Erasing Counts**

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