Kingston® SSD OTCS1S3XXXXQ-B00 Series

Product Specification

Version 1.1

March, 2024

Part Number information

Kingston Part Number	Capacity	Form Factor	FW Version	Flash IC
OTCS1S3128Q-B00	128GB	2.5”	S4I00110	Kioxia BiCS5 TLC Flash IC
OTCS1S3256Q-B00	256GB	2.5”	S4I00108	Kioxia BiCS5 TLC Flash IC
OTCS1S3512Q-B00	512GB	2.5”	S4I00108	Kioxia BiCS5 TLC Flash IC
OTCS1S31024Q-B00	1024GB	2.5”	S4I00108	Kioxia BiCS5 TLC Flash IC

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Revision History

Rev.	Date	Changed Contents
V1.0	2023.10.27	First version published
V1.1	2024.03.13	Add 128GB SKU, revise typo and data to align test method
V1.2	2024.03.15	Revise random performance data

1. Introduction

1.1 General Description

The Kingston® SSD OTCS1S3XXXXQ-B00 is designed and built for personal computing machines, providing the mobility, stability, reliability and powerless capability. Here are three most popular applications for Kingston® SSDs:

Hard drive replacement - Solid-state drives are the next evolution of PC storage and run faster, quieter and cooler than the aging technology inside hard drives. With no moving parts, SSDs are also more durable and more reliable than hard drives.

For desktops and notebooks - Kingston solid-state drives will make your system more responsive so it boots quicker, loads applications faster and shuts down faster. They're available in upgrade kits that include software to clone your files and OS in minutes.

Revive older systems - Solid-state drives will not only increase performance but can also be used to breathe new life into older systems. Choosing an SSD can save you the cost of buying a new PC by reviving the system you already own.

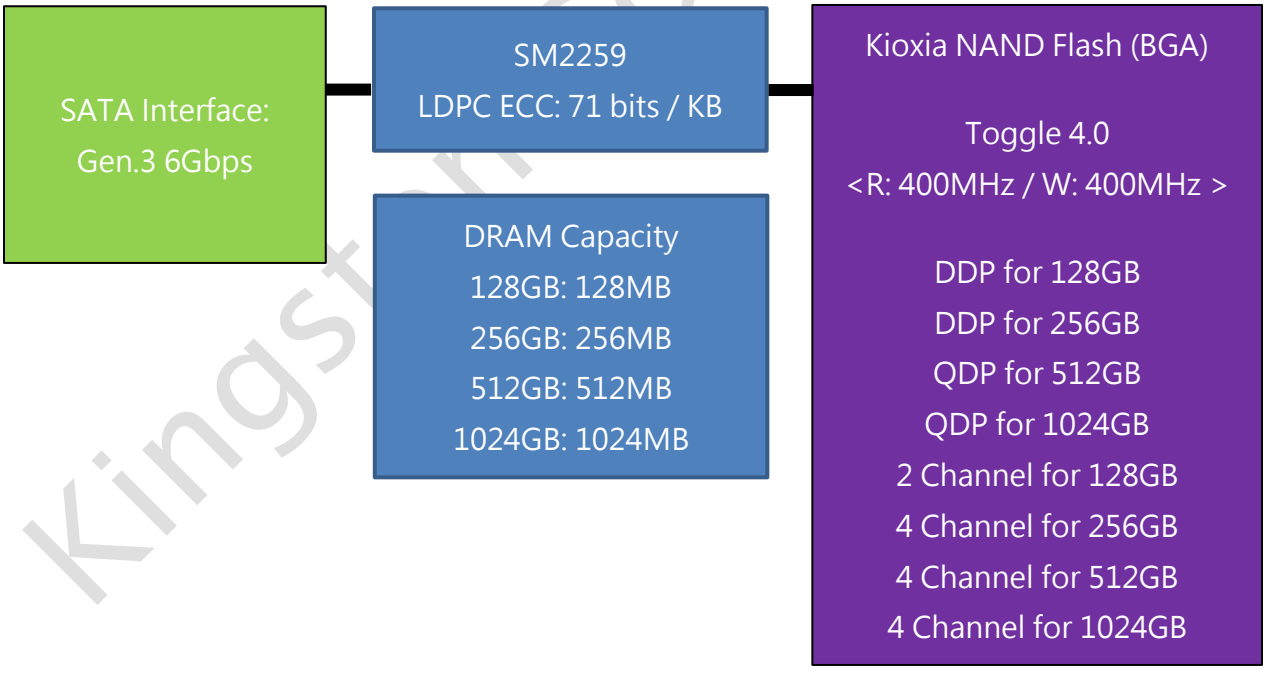

Figure 1-1: Kingston SSD OTCS1S3XXXXQ-B00 Block Diagram

1.2 Advanced Flash Management

1.2.1 Background Garbage Collection

SSDs incorporate advanced controllers that manage the NAND Flash storage. Kingston® uses SiliconMotion®-based controllers in specific SSDs to provide customers with better endurance and performance. These controllers use proprietary technologies to conduct Garbage Collection (GC).

When files are deleted in an Operating System such as Windows, the OS just marks its internal file table indicating that the file is deleted. On hard disk drives (HDDs), the now-invalid data remains there and can be directly overwritten by the system to store new data.

NAND Flash-based devices cannot overwrite data that is already there. They have to go through a Program/Erase cycle; to write to an already used block of data, an SSD controller would first copy all valid data (that which is still in use) and write it to empty pages of a different block, erase all the cells in the current block (both valid and invalid data), and then start writing new data to the newly erased block. This process is called Garbage Collection. Newer OSs also support the TRIM command, whereby the OS notifies the SSD that it has deleted specific files so that the SSD can better manage the GC process to recover that space earlier and prevent saving and moving all that invalid data.

1.2.2 Wear-Leveling

Kingston Flash storage devices incorporate controllers utilizing advanced wear-leveling technology, which distributes the number of P/E cycles (program/erase) across the Flash memory evenly. Wear-leveling thus extends the useful life of a drive and help maintain consistent performance levels over the life of the drive.

1.3 Functional Description

Key Feature	Specification
NCQ(Native Command Queuing)	Support (up to queue depth = 32)
S.M.A.R.T	Support
Trim Command	Support
ACS-3 Revision 4	Support
Dynamic & Static Wear-Leveling	Support
Background Garbage Collection	Support
SATA Revision 3.0	Support
Compatible with SATA 1.5/3.0/6.0 Gb/s	Support
TCG-Opal 2.0	Support
AES 256-bit	Support
Power Saving Mode: (1)Partial Mode (2)Slumber Mode	Support

Table 1-1: Kingston SSD OTCS1S3XXXXQ-B00 Functional Description

2. General Product Specifications

2.1 Capacity

Addressable sectors follow the IDEMA organization standard, reference to *Document LBA1-03 LBA Count for Disk Drives Standard*.

Detail information can refer to website: http://www.idema.org/

Unformatted Capacity[1]	Total User Addressable Sectors in LBA Mode[2]
128GB	250,069,680
256GB	500,118,192
512GB	1,000,215,216
1024GB	2,000,409,264

Table 2-1: Kingston SSD OTCS1S3XXXXQ-B00 Capacity Specification

[1] 1 GB = 1,000,000,000 bytes and not all of the memory can be used for storage.

[2] 1 sector = 512 bytes

2.2 Fundamental Specification

- Capacity – supporting unformatted capacities[1] of 128GB, 256GB, 512GB and 1024GB.
- Form-Factor –2.5" type
- Interface – SATA 6Gb/s (SATA-III), backwards complies with SATA 3Gb/s (SATA-II) and SATA 1.5Gb/s (SATA-I)
- Based on out-of-box performance, speed may vary due to host hardware, software configuration and usage.
- **Performance[2] –**

Capacity	128GB	256GB	512GB	1024GB
Sequential Read	480 MB/s	550 MB/s	550 MB/s	550 MB/s
Sequential Write	440 MB/s	500 MB/s	500 MB/s	500 MB/s
4K Random Read (Q32T1)	38,000 IOPs	70,000 IOPs	90,000 IOPs	90,000 IOPs
4K Random Write (Q32T1)	72,000 IOPs	75,000 IOPs	77,000 IOPs	77,000 IOPs

- **Power consumption[3] –**

Capacity	128GB	256GB	512GB	1024GB
Maximum Read	2.0 W	2.5 W	2.5 W	2.5 W
Maximum Write	2.0 W	2.5 W	2.5 W	2.5 W
Average consumption	0.2 W	0.2 W	0.2 W	0.2 W
Idle consumption	0.15 W	0.15 W	0.15 W	0.15 W

[1] 1 GB = 1,000,000,000 bytes. Not all of the memory can be used for storage.

[2] Performance data based on the CrystalDiskMark 8.0.4 x64 test result. Speed may vary due to host hardware, software and usage.

[3] Maximum Power bases on CrystalDiskMark 8.0.4 default setting sequential read/write workload. Average/Idle bases on MobileMark2014 workload.

2.3 Power Specification

Parameter	Specification
Input Voltage	5.0V +/- 5%
Maximum Ripple	NA

Table 2-2: Kingston SSD OTCS1S3XXXXQ-B00 Power Specification

2.4 Reliability Specifications

Parameter	Requirement
Uncorrectable Bit Error Rate (UBER)	≤ 10^{-15}
Mean Time between Failure (MTBF)	2,000,000 hours

Table 2-3: Kingston SSD OTCS1S3XXXXQ-B00 Reliability Specifications

2.5 Endurance and Warranty Policy

Kingston warrants to the original end user customer that its products are free from defects in material and workmanship. This product is covered by Kingston warranty for one of the following periods, whichever occurs first:

(i) Five years from the date of purchase by the original end user customer

(ii) Until the date when the SSD reached its TBW threshold as measured by Kingston software.

Parameter	Specification
Warranty Period	5 years warranty
TBW[1] (Tera-Byte Written)	128GB — 80TB 256GB — 160TB 512GB — 300TB 1024GB — 600TB

Table 2-4: Kingston SSD OTCS1S3XXXXQ-B00 Endurance and Warranty Policy

[1] The value of TBW is calculated by WAF (Write Amplification Factor), which is measured with JEDEC 219A Standard Client Workload.

3. Physical Specification

The 2.5" Form-Factor complies with SATA standard. Detail mechanical design parameters as below. Tolerance data also included.

Parameter	Specification
Length	100.10mm ±0.15mm
Width	69.9mm ±0.15mm
Thickness	7.00mm(max)
Weight	45g (max)

Table 3-1: Mechanical Design parameters

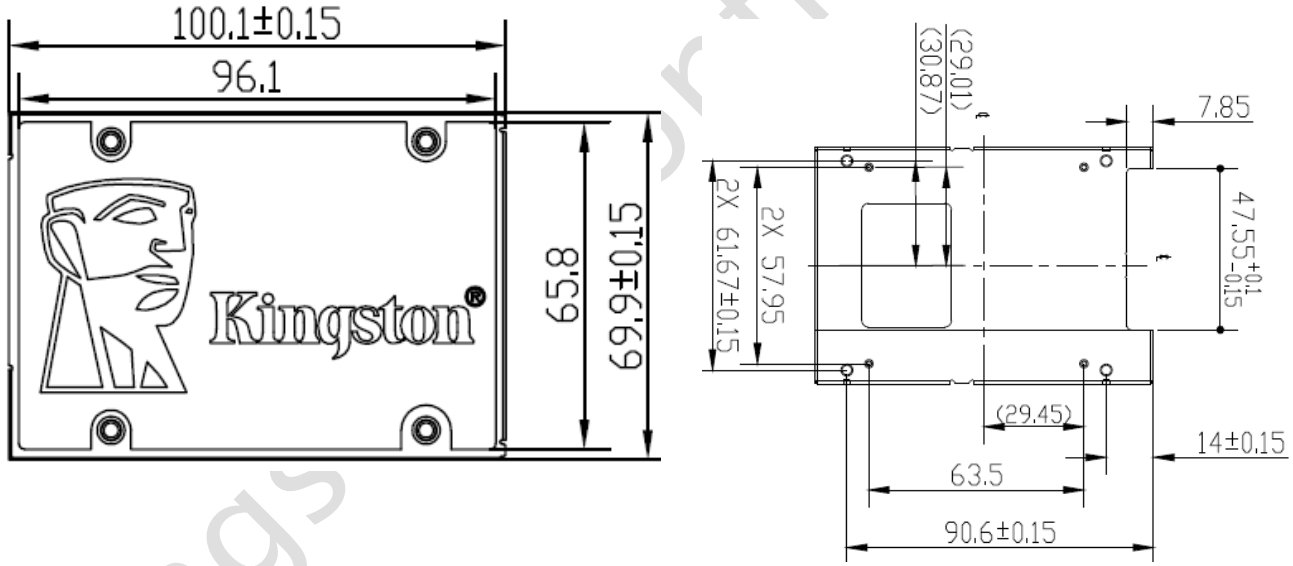

Figure 3-1: 3D View of SSD

4. Environment Specifications

4.1 Storage Specification

Environment	Mode	Min	Max	unit
Ambient Temperature	Operating	-40	85	℃
	Storage	-40	85	℃
Humidity	Operating		85	%
	Storage		85	%

Table 4-1: Kingston SSD OTCS1S3XXXXQ-B00 Environment Specification

4.2 Durability Specification

Every material needs to pass the ICQ unit's VI and quality test. Regular durability test include the new PCBA and the running material. To make sure product durability is consistence.

Item	Mode	Test Criteria
Shock	Operation	105G acceleration peak 6.5ms pulse duration
Vibration	Non-operation	Sin wave, 10-1000Hz 10G acceleration

Table 4-2: Kingston SSD OTCS1S3XXXXQ-B00 Durability Specification

4.3 Safety Compliance Specification

The Kingston SSD OTCS1S3XXXXQ-B00 is certified to comply with the following standards.

Certification	Standard
CE	EN 55032:2015+A11:2020 EN 55035:2017+A11:2020
FCC	FCC 47 CFR Part 15, Subpart B: 2020
ICES	ICES-003 Issue 7 (2020)
RCM	AS/NZS CISPR 32:2015
VCCI	VCCI-CISPR 32:2016
BSMI	CNS 13438 (95 full version) Category B or CNS 15936 (full version 105) Class B
CB	CB IEC 62368-1:2018 CB IEC 62368-1:2014
LVD	EN 62368-1:2014+A11:2017 IEC 62368-1:2014
TUV	UL 62368-1:2019 CSA C22.2 NO. 62368-1:19
KCC	KCC KN 32, KN 35
UKCA	BS EN 55032:2015+A11:2020 BS EN 55035:2017+A11:2020
Others	RoHS, REACH/SVHC, California Prop 65

Table 4-3: Kingston SSD OTCS1S3XXXXQ-B00 Safety Compliance Specification

5. Pin Signal Definition

Name		Type	Description
Signal Segment	S1	GND	
	S2	A+	Differential Signal Pair A
	S3	A-	
	S4	GND	
	S5	B-	Differential Signal Pair B
	S6	B+	
	S7	GND	
Key and Spacing separate signal and power segments			
Power Segment	P1	NC	No Connect
	P2	NC	No Connect
	P3	NC	No Connect
	P4	GND	
	P5	GND	
	P6	GND	
	P7	5V	5V Power
	P8	5V	5V Power
	P9	5V	5V Power
	P10	GND	
	P11	Vendor	Vendor specific use
	P12	GND	
	P13	NC	No Connect
	P14	NC	No Connect
	P15	NC	No Connect

Table 5-1: Pin assignments

6. Supported ATA Command List

Op Code	Description	Op Code	Description
E5h	Check power mode	F6h	Security Disable Password
06h	Data Set management	F3h	Security Erase Prepare
B1H	DCO	F4h	Security Erase Unit
92h	Download Microcode PIO	F5h	Security Freeze Lock
93h	Download Microcode DMA	F1h	Security Set Password
90h	Execute drive diagnostic	F2h	Security Unlock
E7h	Flush cache	70h	Seek
Eah	Flush cache Ext	Efh	Set features
Ech	Identify device	F9h	Set Max Address
E3h	Idle	37h	Set Max Address Ext
E1h	Idle immediate	C6h	Set multiple mode
91h	Initialize drive parameters	E6h	Sleep
E4h	Read buffer	B0h	Smart
C9h	Read DMA (w/o retry)	E2h	Standby
C8h	Read DMA (w/retry)	E0h	Standby immediate
25h	Read DMA Ext	E8h	Write buffer
60h	Read FPDMA QUEUED	CBh	Write DMA (w/o retry)
2Fh	Read Log Ext	Cah	Write DMA (w/retry)
C4h	Read multiple	35h	Write DMA Ext
29h	Read multiple Ext	3Dh	Write DMA FUA Ext
F8h	Read native max address	61h	Write FPDMA QUEUED
27h	Read native max Ext	3Fh	Write Log Ext
21h	Read sector(s) (w/o retry)	C5h	Write multiple
20h	Read sector(s) (w/retry)	39h	Write multiple Ext
24h	Read sector(s) Ext	Ceh	Write multiple FUA Ext
42h	Read Verify Ext	31h	Write sector(s) (w/o retry)
41h	Read verify sector(s) (w/o retry)	30h	Write sector(s) (w/retry)
40h	Read verify sector(s) (w/retry)	34h	Write sector(s) Ext
10h	Recalibrate	45h	Write uncorrectable

Table 6-1: Supported ATA Command List

7. Label Definition

Label definition on the label samples (as Fig. 7-1) is only for demonstration of every part on the label, not real information. Detail information is in the Table 7-1.

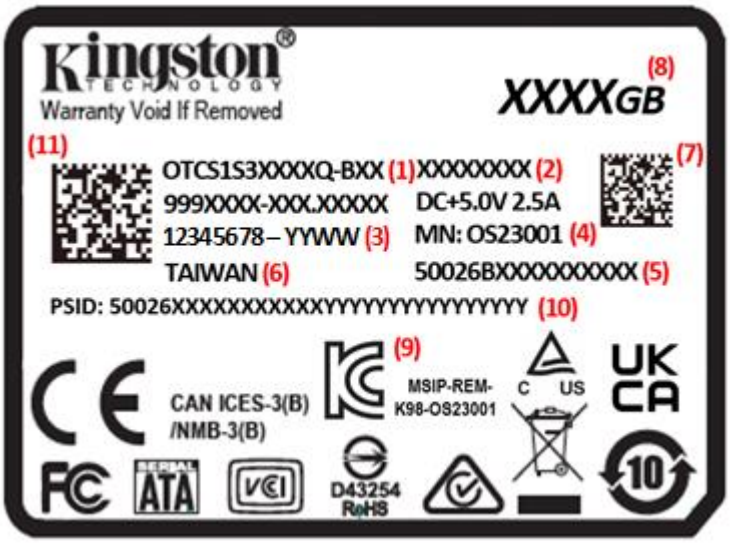

Figure 7-1: Label Sample

	Item	Display Sample	Remark
1	SKU	OTCS1S3XXXXQ-BXX	KTC SKU number (Part number) xxxx = device capacity (may be 2~4 digits, depending on device capacity)
2	Firmware	XXXXXXXX	Firmware
3	WO#, Date code	12345678 - YYWW	
4	Series model name	MN: OS23001	
5	Serial Number	50026BXXXXXXXXXX	Format: 50026BXXXXXXXXXX * XXXXXX: Suffix code
6	Product Made in	TAIWAN / CHINA	
7	2D barcode	OTCS1S3XXXXQ-BXX50026BXXXXXXXXXX	2D Barcode. (SKU+SN)
8	Capacity	128GB / 256GB / 512GB / 1024GB	depending on device capacity
9	Compliance logos		
10	PSID	50026BXXXXXXXXXXYYYYYYYYYYYYYYYY	
11	PSID 2D barcode		

Table 7-1: Label Information

8. SMART Attribute

SMART Attributes provide the SSD's detail working information, like power-on hours or write from host…etc. to help SSD vendor to monitor the health situation and diagnosis while SSD have been damaged or panic under abnormal user behavior. Under debugging purpose, Kingston will change the SMART attributes content without notify.

SMART ID	Attribute Description	Unit
01h	Read Error Rate	%
05h	Reallocated Sectors Count	Count
09h	Power On Hours	Hour
0Ch	Power Cycle Count	Cycle
9Fh	DRAM ECC 1bits Error Count	Count
A7h	TLC Average Erase Count	Count
C0h	Unexpected Power Loss Count	Cycle
C2h	Temperature	Celsius
C4h	Reallocation Event Count	Count
E7h	SSD life remaining	%
F1h	Total Host Writes	32MB
F2h	Total Host Reads	32MB

Table 8-1: SMART Attribute