

## > XG5 SERIES CLIENT SSD

XG5 series SSDs feature Toshiba's latest 64-layer, 3D TLC (3-bit-per-cell) flash memory BiCS FLASH™. This new line of NVMe™ based client SSDs deliver high performance up to 3000 MB/s of sequential read and 2100 MB/s of sequential write with a maximum interface bandwidth of 32 GT/s. XG5 series SSDs also feature an SLC cache to accelerate burst type workloads, as well as improved power consumption comparing to prior generation XG3, making these SSDs an efficient option for high performance mobile computing.

XG5 Series SSDs are available in 256GB, 512GB and 1024GB capacities in compact single-sided M.2 2280 form factors.

Self-encrypting drive (SED) models supporting TCG Opal Version 2.01 are also offered, making the new series highly suited to address data security needs for commercial PCs or other business applications.

## SSD



Product image may represent a design model

### > KEY FEATURES

- Toshiba 64-Layer BiCS FLASH™
- PCIe® Gen3\*4L NVMe™
- Capacities up to 1024GB
- M.2 2280 Single-sided
- TCG OPAL 2.01 Optional for SED

### > APPLICATIONS

- Thin performance Notebook
- Enthusiast Desktop/Laptop
- Mainstream PC Computing
- Server/Storage Boot

\* Availability of the SED model line-up may vary by region.

### > SPECIFICATIONS

Standard Models		M.2 2280-S2 (Single-sided)		
Model Number		KXG50ZNV256G KXG5AZNV256G	KXG50ZNV512G KXG5AZNV512G	KXG50ZNV1T02 KXG5AZNV1T02
Memory		TOSHIBA BiCS FLASH™		
Interface		PCI Express® Base Specification Revision 3.1 (PCIe®)		
Maximum Speed		32 GT/s (PCIe® Gen3x4 Lane)		
Command		NVM Express™ Revision 1.2.1 (NVMe™)		
Connector Type		M.2 M		
Formatted Capacity <sup>1)</sup>		256 GB	512 GB	1,024 GB
Performance <sup>2)</sup>	Sequential Read	2,700 MB/s {2,580 MiB/s}	3,000 MB/s {2,900 MiB/s}	
	Sequential Write	Up to 1,050 MB/s {1,000 MiB/s}		Up to 2,100 MB/s {2,000 MiB/s}
Supply Voltage		3.3 V ±5 %		
Power Consumption	Active	4.0 W typ.	4.3 W typ.	4.5 W typ.
	L1.2 mode	3 mW typ.		
Size		80.0 mm x 22.0 mm x 2.23 mm		
Weight		7.0 g typ.	7.3 g typ.	

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Standard Models		M.2 2280-S2 (Single-sided)
Temperature	Operating	0 to 95 °C (Controller Temperature) 0 to 85 °C (Other Components Temperature)
	Non-operating	-40 to 85 °C
Reliability <sup>3)</sup>		Mean Time to Failure (MTTF): 1,500,000 hours Product Life: Approximately 5 years
More Features		<ul style="list-style-type: none"> <li>• Device Self-test is supported.</li> <li>• Host Controlled Thermal Management (HCTM) is supported.</li> <li>• Strong &amp; highly-efficient ECC named QSBC™ is supported.</li> <li>• TCG Pyrite Version 1.00 is supported.</li> <li>• Storage Interface Interactions Specification(SIIS) Version 1.06 is supported.</li> </ul>
Compliance		UL, cUL, TÜV, KC, FCC, BSMI, CE, RCM, IC, VCCI

Note: 1) Definition of capacity: Toshiba defines a megabyte (MB) as 1,000,000 bytes, a gigabyte (GB) as 1,000,000,000 bytes and a terabyte (TB) as 1,000,000,000,000 bytes. A computer operating system, however, reports storage capacity using powers of 2 for the definition of 1GB = 230 = 1,073,741,824 bytes and therefore shows less storage capacity. Available storage capacity (including examples of various media files) will vary based on file size, formatting, settings, software and operating system, such as Microsoft Operating System and/or pre-installed software applications, or media content. Actual formatted capacity may vary.

2) 1 MiB (mebibyte) = 2<sup>20</sup> bytes = 1,048,576 bytes, and 1 MB (megabyte) = 1,000,000 bytes.

3) MTTF (Mean Time to Failure) is not a guarantee or estimate of product life; it is a statistical value related to mean failure rates for a large number of products which may not accurately reflect actual operation. Actual operating life of the product may be different from the MTTF.

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\* NVMe™ and NVM Express™ are trademarks of NVM Express, Inc.

\* Product image may represent a design model.

\* Read and write speed may vary depending on the host device, read and write conditions, and file size.

/ > ORDERING INFORMATION

K   XX   X   X   X   X   X   XXXX  
1   2   3   4   5   6   7   8

- |    |                        |  |
|----|------------------------|--|
| 1. | Product Name           | K: SSD product   |
| 2. | Prodct Category        | XG: XG Series  |
| 3. | Development Generation | 5: Generation 5  |
| 4. | Option Code 1          | 0: Non-SED<br>A: SED   |
| 5. | Option Code 2          | Z: No-option   |
| 6. | Connector Type         | N: M.2 M (PCI Express® I/F)  |
| 7. | Form Factor            | V: M.2 2280 Single Sided/M.2 M type  |
| 8. | Capacity               | 128G / 256G / 512G /1T02<br><br>128G is 128 GB, 256G is 256 GB, 512G is 512 GB and 1T02 is 1024 GB<br>(1 GB = 1,000,000,000 bytes) |

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## > PRODUCT LINE UP

Model Number	Formatted Capacity	Form Factor/Connect Type	Function Note
KXG50ZNV256G	256 GB	M.2 2280-S2 <sup>1)</sup> -M module	Non- SED
KXG50ZNV512G	512 GB		
KXG50ZNV1T02	1,024 GB		
KXG5AZNV256G	256 GB		SED <sup>2)</sup>
KXG5AZNV512G	512 GB		
KXG5AZNV1T02	1,024 GB		

Note: 1) Single Sided

2) Availability of the SED model line-up may vary by region.

## > CAPACITY

Capacity	Total Number of User Addressable Sectors in LBA Mode	
	512 bytes sector	4,096 bytes sector
256 GB	500,118,192	62,514,774
512 GB	1,000,215,216	125,026,902
1,024 GB	2,000,409,264	250,051,158

Note: 1 GB (Gigabyte) = 1,000,000,000 bytes

## > PERFORMANCE

Standard Models	KXG50ZNV256G KXG5AZNV256G	KXG50ZNV512G KXG5AZNV512G	KXG50ZNV1T02 KXG5AZNV1T02
Interface Speed	32 GT/s (Gen3x4 Lane), 20 GT/s (Gen2x4 Lane), 16 GT/s (Gen3x2 Lane), 10 GT/s (Gen2x2 Lane)		
@32GT/s			
Sequential Read <sup>1)</sup>	2,700 MB/s {2,580 MiB/s}	3,000 MB/s {2,900 MiB/s}	3,000 MB/s {2,900 MiB/s}
Sequential Write <sup>2)3)</sup>	1,050 MB/s {1,000 MiB/s}	1,050 MB/s {1,000 MiB/s}	2,100 MB/s {2,000 MiB/s}
Time from Power-on to process the Admin Commands <sup>4)</sup>	100 ms typ.		
Time from Power-on to process the I/O Commnads <sup>4)</sup>	100 ms typ.		

Note: 1) Under the condition of measurement with 128 KiB unit sequential access (1 KiB = 1024 bytes) and queue depth is 64.  
2) Under the condition of measurement with 128 KiB unit sequential access with 4KiB (1 KiB = 1024 bytes) align and queue depth is 64.  
3) SLC cache is effective.  
4) After unexpected power down, it may increase up to 10 s.

## > SUPPLY VOLTAGE

Standard Models	M.2 2280 Module
Allowable voltage	3.3 V ±5 %
Allowable noise/ripple	100 mV p-p or less, 0-10 MHz
Allowable supply rise time	2 –100 ms

Note: The drive has over current protection circuit. (Rated current: 3.15A)

## > POWER CONSUMPTION

Operation (Ta 1)=25°C)	M.2 2280 Module		
	KXG50ZNV256G KXG5AZNV256G	KXG50ZNV512G KXG5AZNV512G	KXG50ZNV1T02 KXG5AZNV1T02
Read <sup>2)</sup>	4.0 W typ.	4.3 W typ.	4.5 W typ.
Write <sup>2)</sup>	2.6 W typ.	2.6 W typ.	3.4 W typ.
Power State 3 <sup>3)</sup>	50.0 mW typ.	50.0 mW typ.	50.0 mW typ.
Power State 4 <sup>3)</sup>	5.0 mW typ.	5.0 mW typ.	5.0 mW typ.
Power State 5 <sup>3)</sup>	3.0 mW typ.	3.0 mW typ.	3.0 mW typ.

Note: 1) Ambient Temperature  
2) The values are specified at the condition causing maximum power consumption and Power State 0.  
3) PCIe Link state is L1.2. Power consumption during the Admin command processing is excluded.

## ENVIRONMENTAL CONDITIONS

### > TEMPERATURE

Condition	Range	Gradient
Operating <sup>1)</sup>	0°C (Tc) – 95°C (Tc) (Controller Temperature) 0°C (Tc) – 95°C (Tc) (Other Components Temperature)	30 °C (Ta) / h maximum
Non-operating	-40 °C – 85 °C	30 °C / h maximum
Under Shipment <sup>2)</sup>	-40 °C – 85 °C	30 °C / h maximum

Note: 1) Ta: Ambient Temperature, Tc: Components Temperature

2) Packaged in Toshiba's original shipping package

### > HUMIDITY

Condition	Range
Operating	8 % – 90 % R.H. (No condensation)
Non-operating	8 % – 95 % R.H. (No condensation)
Under Shipment <sup>1)</sup>	5 % – 95 % R.H.
Max. wet bulb	32.5 °C (Operating) 40.0 °C (Non-operating / Shipping)

Note: 1) Packaged in Toshiba's original shipping package

### > SHOCK

Condition	Range
Operating	14.709 km/s <sup>2</sup> {1,500 G}, 0.5 ms half sine wave
Non-operating	

### > VIBRATION

Condition	Range
Operating	196 m/s <sup>2</sup> {20 G} Peak, 10 - 2,000 Hz (20 minutes per axis) x 3 axis
Non-operating	

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## COMPLIANCE

### > SAFETY / EMI STANDARDS

Title	Description	Region
UL (Underwriters Laboratories)	UL 60950-1	USA <sup>1)</sup>
cUL (Underwriters Laboratories of Canada)	CSA-C22.2 No.60950-1-07	Canada
TÜV (Technischer Überwachungs Verein)	EN 60950-1	EURO
KC	KN32, KN35	Korea
FCC	FCC part 15 Subpart B	USA
BSMI (Bureau of Standards, Metrology and Inspection)	CNS13438 (CISPR Pub. 22)	Taiwan
CE	EN 55032, EN 55024	EURO
RCM	AS/NZS CISPR 32	Australia, New Zealand
ISED	ICES-003	Canada
VCCI	VCCI-CISPR32	Japan

Note: 1) UL certification is basically on a voluntary basis.

### > RELIABILITY

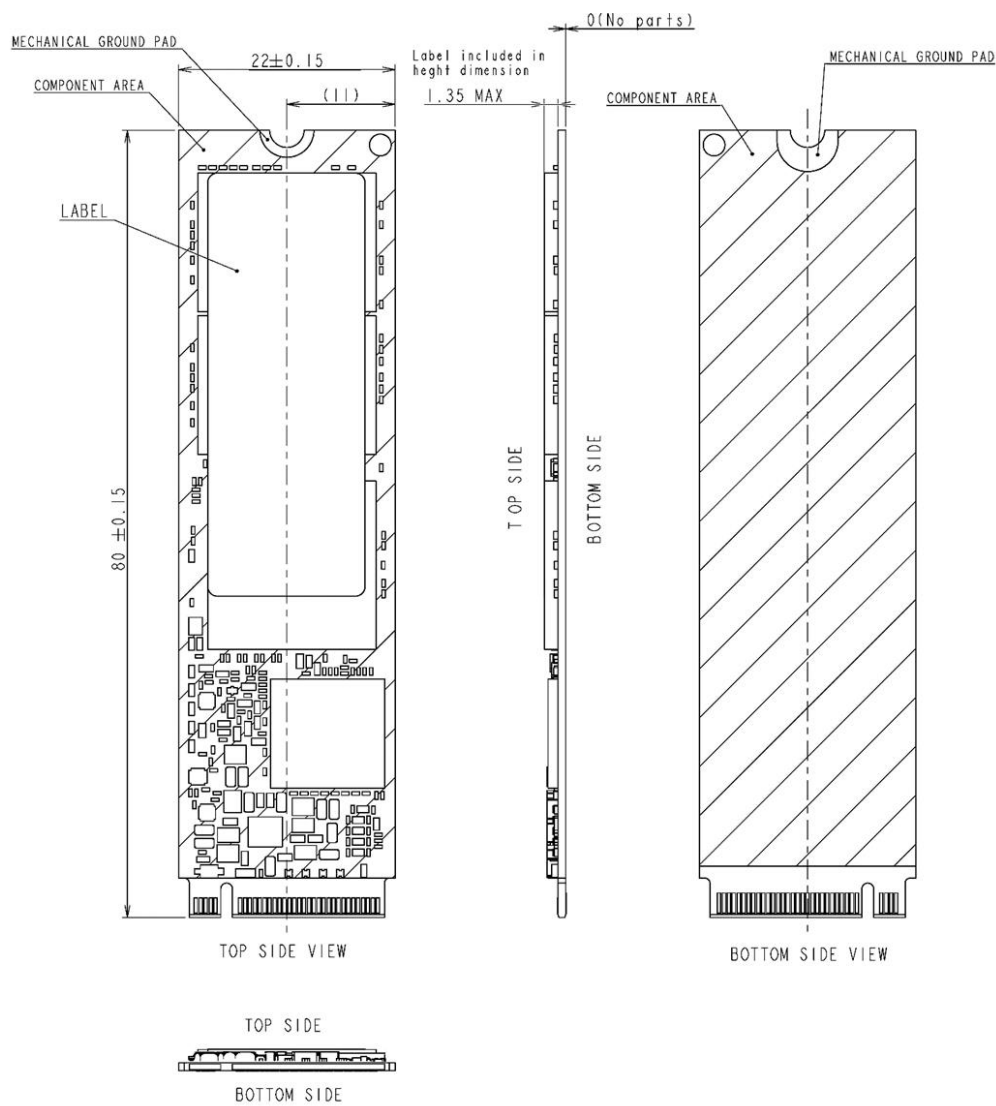
Parameter	Value
Mean Time to Failure	1,500,000 hours
Product Life	Approximately 5 years

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**MECHANICAL SPECIFICATIONS**

**> M.2 2280 MODULE**

Model Number	Weight	Width	Height	Length
KXG50ZNV256G KXG5AZNV256G	7.0 g typ.	22.00 mm	2.23 mm	80.00 mm
KXG50ZNV512G KXG5AZNV512G	7.3 g typ.			
KXG50ZNV1T02 KXG5AZNV1T02	7.3 g typ.			



Unit:mm

**Figure 1: Dimension of KXG5xZNVxxxx (M.2 2280-S2 Module)**

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## > PIN ASSIGNMENT ON M.2 2280 MODULE CONNECTOR

Pin #	Name	Description
1	GND	GND
3	GND	GND
5	PETn3	PCIe Lane 3 Device Transmitter
7	PETp3	
9	GND	GND
11	PERn3	PCIe Lane 3 Device Receiver
13	PERp3	
15	GND	GND
17	PETn2	PCIe Lane 2 Device Transmitter
19	PETp2	
21	GND	GND
23	PERn2	PCIe Lane 2 Device Receiver
25	PERp2	
27	GND	GND
29	PETn1	PCIe Lane 1 Device Transmitter
31	PETp1	
33	GND	GND
35	PERn1	PCIe Lane 1 Device Receiver
37	PERp1	
39	GND	GND
41	PETn0	PCIe Lane 0 Device Transmitter
43	PETp0	
45	GND	GND
47	PERn0	PCIe Lane 0 Device Receiver
49	PERp0	
51	GND	GND
53	REFCLKn	PCIe Reference Clock
55	REFCLKp	PCIe Reference Clock
57	GND	GND
Notch		
67	Reserved	NC
69	PEDET	NC-PCIe
71	GND	GND
73	GND	GND
75	GND	GND

Pin #	Name	Description
2	+3.3V	3.3 V Source
4	+3.3V	3.3 V Source
6	Reserved	NC
8	Reserved	NC
10	LED1#	Device Activity
12	+3.3V	3.3 V Source
14	+3.3V	3.3 V Source
16	+3.3V	3.3 V Source
18	+3.3V	3.3 V Source
20	Reserved	NC
22	Reserved	NC
24	Reserved	NC
26	Reserved	NC
28	Reserved	NC
30	Reserved	NC
32	Reserved	NC
34	Reserved	NC
36	Reserved	NC
38	Reserved	NC
40	Reserved	NC
42	Reserved	NC
44	Reserved	NC
46	Reserved	NC
48	Reserved	NC
50	PERST# <sup>1)</sup>	PE-Reset
52	CLKREQ#	Clock Request
54	PEWAKE#	NC
56	MFG1	Manufacturing pin. Must be no-connect on the host board.
58	MFG2	
Notch		
68	SUSCLK	NC
70	+3.3V	3.3 V Source
72	+3.3V	3.3 V Source
74	+3.3V	3.3 V Source

Note: 1) The drive can't detect PERST# in L1.2.

## > COMMAND TABLE

### ADMIN Command set

Op-Code	Command Name
00h	Delete I/O Submission Queue
01h	Create I/O Submission Queue
02h	Get Log Page
04h	Delete I/O Completion Queue
05h	Create I/O Completion Queue
06h	Identify
08h	Abort
09h	Set Features
0Ah	Get Features
0Ch	Asynchronous Event Request
10h	Firmware Commit
11h	Firmware Image Download
14h	Device Self-Test (DST)
80h	Format NVM
81h	Security Send
82h	Security Receive

### Set Features / Get Features Set

Op-Code	Feature Name
01h	Arbitration
02h	Power Management
03h	LBA Range Type
04h	Temperature Threshold
05h	Error Recovery
06h	Volatile Write Cache
07h	Number of Queues
08h	Interrupt Coalescing
09h	Interrupt Vector Configuration
0Ah	Write Atomicity Normal
0Bh	Asynchronous Event Configuration
0Ch	Autonomous Power State Transition
0Eh	Time Stamp
10h	Host Controlled Thermal Management (HCTM)
80h	Software Progress Marker

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## NVM Command Set

Op-Code	Command Name
00h	Flush
01h	Write
02h	Read
04h	Write Uncorrectable
05h	Compare
08h	Write Zeroes
09h	Dataset Management

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