TOSHIBA
Leading Innovation

XG5-P SERIES

CLIENT SSD

SSD

Product image may represent a design model

The premium XG5-P series, maintaining the key features of the XG5 series such as NVMe™ revision 1.2.1, single-sided M.2 2280 form factor and low power consumption, delivers enhanced performance of up to 3000 MB/s sequential read, 2200 MB/s sequential write, 320,000 random read IOPS and 265,000 random write IOPS.

Thanks to in-house developed 64-layer, 3D flash memory BiCS FLASH™ and 1TB package technology, Toshiba Memory Corporation maintains a single, ultra-thin form factor for all capacities across the XG5-P and XG5 product families, and offers dimensional compatibility to platforms that need flexible storage.

The XG5-P series is available in 1TB and 2TB large capacity models for workstation, high-end PCs, as well as read-intensive applications. Self-encrypting drive (SED) models supporting TCG Opal Version 2.01 are also available as an option for data security concerns.

KEY FEATURES

- Toshiba 64-Layer BiCS FLASH™
- PCIe® Gen3*4L NVMe™
- Capacities up to 2048GB
- M.2 2280 Single-sided
- TCG OPAL 2.01 Optional for SED

APPLICATIONS

- Work station PCs
- Gaming, Enthusiast PCs
- Embedded performance driven application
- Read-intensive enterprise use

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

SPECIFICATIONS

Standard Models		M.2 2280-S2 (Single-sided)	
Model Number		KXG50PNV1T02 KXG5APNV1T02	KXG50PNV2T04 KXG5APNV2T04
Memory		TOSHIBA BiCS FLASH™	
Interface		PCI Express® Base Specification Revision 3.1 (PCIe®)	
Maximum Speed		32 GT/s (PCIe® Gen3×4 Lane)	
Command		NVM Express™ Revision 1.2.1 (NVMe™)	
Connector Type		M.2 M	
Formatted Capacity[1)]		1,024 GB	2,048 GB
Performance[2)] (Up to)	Sequential Read	3,000 MB/s {2,900 MiB/s}	
	Sequential Write	2,100 MB/s {2,000 MiB/s}	2,200 MB/s {2,100 MiB/s}
Supply Voltage		3.3 V ±5 %	
Power Consumption	Active	4.8 W typ.	4.9 W typ.
	L1.2 mode	3 mW typ.	
Size		80.0 mm x 22.0 mm x 2.23 mm	
Weight		7.3 g typ.	

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[3)]		Mean Time to Failure (MTTF): 1,500,000 hours Product Life: Approximately 5 years
More Features		· Device Self-test is supported. · Host Controlled Thermal Management (HCTM) is supported. · Strong & highly-efficient ECC named QSBC™ is supported. · TCG Pyrite Version 1.00 is supported. · Storage Interface Interactions Specification(SIIS) Version 1.06 is supported.
Compliance		UL, cUL, TÜV, KC, FCC, BSMI, CE, RCM, ISED, VCCI, Moroccan conformity mark

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 = 2^{30} = 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^{20} 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.

* PCIe® and PCI Express® are registered trademarks of PCI-SIG
* 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
		A: SED
5.	Option Code 2	P: Performance enhancement model
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	1T02 / 2T04
		1T02 is 1024 GB and 2T04 is 2048 GB. (1 GB = 1,000,000,000 bytes)

PRODUCT LINE UP

Model Number	Formatted Capacity	Form Factor/Connect Type	Function Note
KXG50PNV1T02	1,024 GB	M.2 2280-S2[1)]-M module	Non- SED
KXG50PNV2T04	2,048 GB		
KXG5APNV1T02	1,024 GB		SED[2)]
KXG5APNV2T04	2,048 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
1,024 GB	2,000,409,264	250,051,158
2,048 GB	4,000,797,360	500,099,670

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

PERFORMANCE

Standard Models	KXG50PNV1T02 KXG5APNV1T02	KXG50PNV2T04 KXG5APNV2T04
Interface Speed	32 GT/s (Gen3x4 Lane), 20 GT/s (Gen2x4 Lane), 16 GT/s (Gen3x2 Lane), 10 GT/s (Gen2x2 Lane)	
Sequential Read[1)] (Up to)	3,000 MB/s {2,900 MiB/s}	
Sequential Write[2)3)] (Up to)	2,100 MB/s {2,000 MiB/s}	2,200 MB/s {2,100 MiB/s}
Time from Power-on to process the Admin Commands[4)]	100 ms typ.	
Time from Power-on to process the I/O Commands[4)]	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 4 KiB (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	
	KXG50PNV1T02 KXG5APNV1T02	KXG50PNV2T04 KXG5APNV2T04
Read[2)]	4.8 W typ.	4.9 W typ.
Write[2)]	3.6 W typ.	4.0 W typ.
Power State 3[3)]	50.0 mW typ.	50.0 mW typ.
Power State 4[3)]	8.0 mW typ.	8.0 mW typ.
Power State 5[3)]	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[1)]	0°C (Tc) – 95°C (Tc) (Controller Temperature) 0°C (Tc) – 85°C (Tc) (Other Components Temperature)	30 °C (Ta) / h maximum
Non-operating	-40 °C – 85 °C	30 °C / h maximum
Under Shipment[2)]	-40 °C – 85 °C	30 °C / h maximum

Note: 1) Ta: Ambient Temperature, Tc: Components Temperature
2) Packaged in Toshiba Memory Corporation's original shipping package

HUMIDITY

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

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

SHOCK

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

VIBRATION

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

COMPLIANCE

SAFETY / EMI STANDARDS

Title	Description	Region
UL	UL 60950-1	USA[1)]
cUL	CSA-C22.2 No.60950-1-07	Canada
TÜV	EN 60950-1	EURO
KC	KN32, KN35	Korea
FCC	FCC part 15 Subpart B	USA
BSMI	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
Moroccan conformity mark	NM EN 55032, NM EN55024	Morocco

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

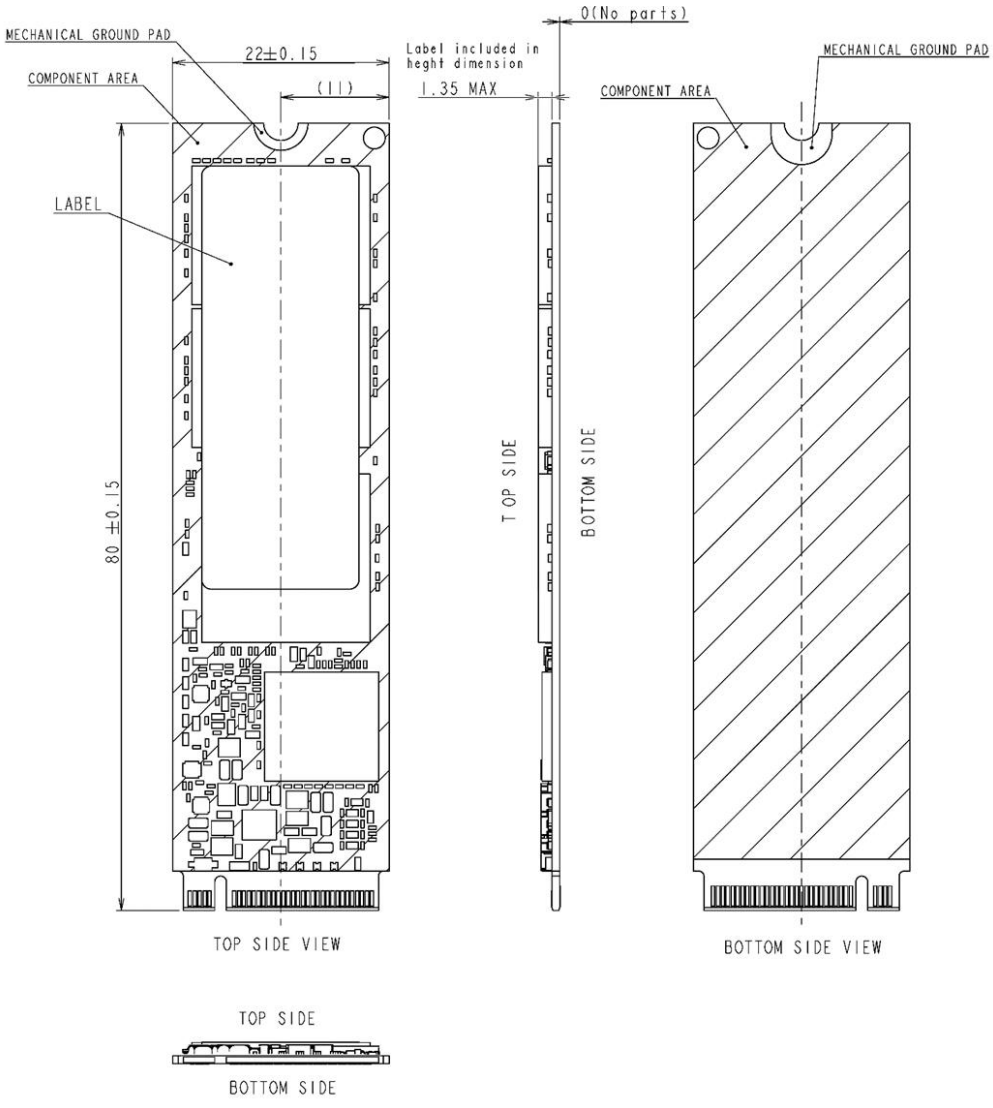
RELIABILITY

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

MECHANICAL SPECIFICATIONS

M.2 2280 MODULE

Model Number	Weight	Width	Height	Length
KXG50PNV1T02 KXG5APNV1T02	7.3 g typ.	22.00 mm	2.23 mm	80.00 mm
KXG50PNV2T04 KXG5APNV2T04				

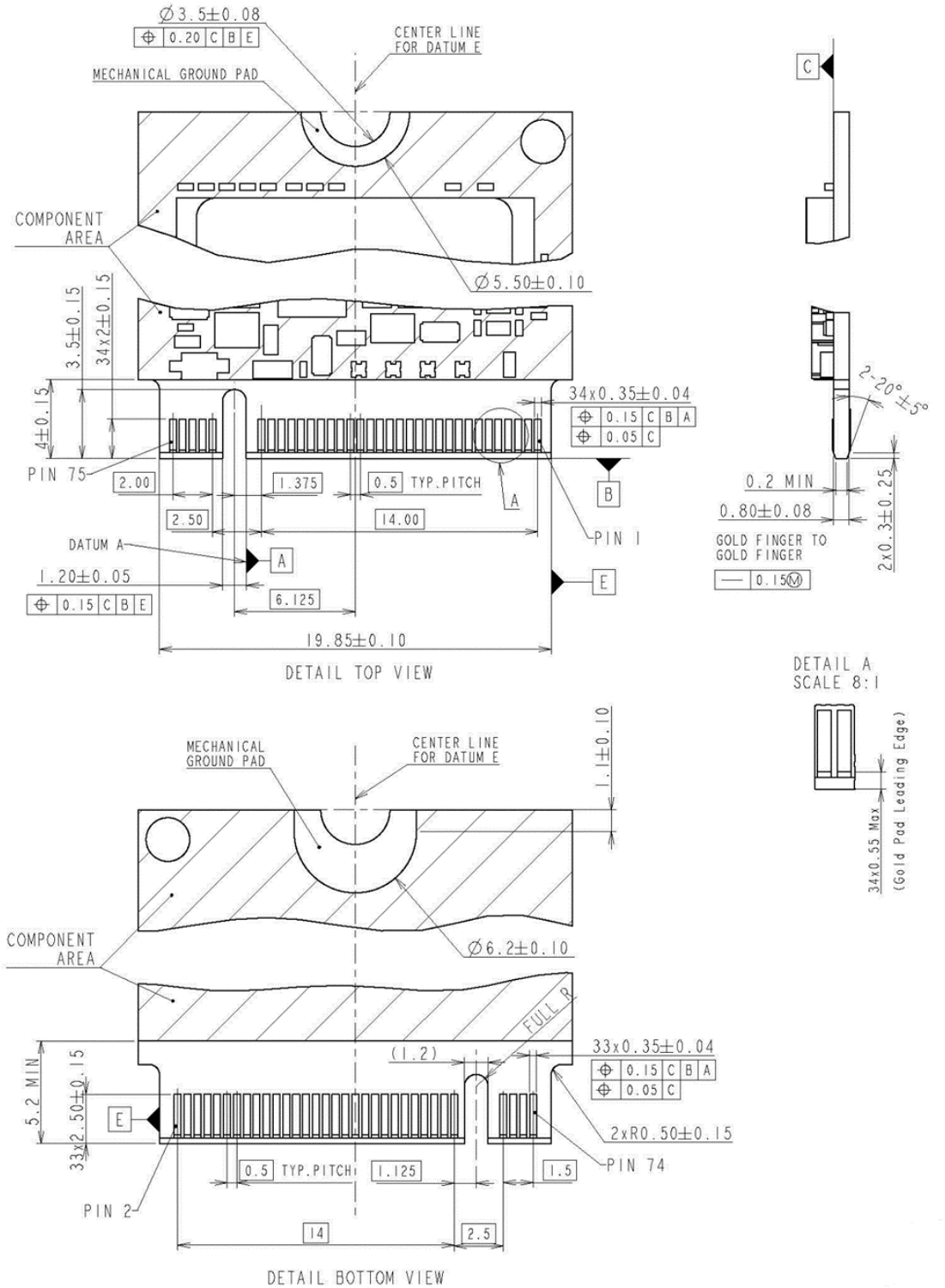


Unit:mm

Figure 1: Dimension of KXG5xPNVxxxx (M.2 2280-S2 Module)

INTERFACE CONNECTOR

M.2 2280 MODULE INTERFACE CONNECTOR



Unit:mm

Figure 2: Interface Dimensions of KXG5xPNVxxxx (M.2 2280 Module)

PIN ASSIGNMENT ON M.2 2280 MODULE CONNECTOR

Pin #	Name	Description	Pin #	Name	Description
1	GND	GND	2	+3.3V	3.3 V Source
3	GND	GND	4	+3.3V	3.3 V Source
5	PETn3	PCIe Lane 3 Device Transmitter	6	Reserved	NC
7	PETp3		8	Reserved	NC
9	GND	GND	10	LED1#	Device Activity
11	PERn3	PCIe Lane 3 Device Receiver	12	+3.3V	3.3 V Source
13	PERp3		14	+3.3V	3.3 V Source
15	GND	GND	16	+3.3V	3.3 V Source
17	PETn2	PCIe Lane 2 Device Transmitter	18	+3.3V	3.3 V Source
19	PETp2		20	Reserved	NC
21	GND	GND	22	Reserved	NC
23	PERn2	PCIe Lane 2 Device Receiver	24	Reserved	NC
25	PERp2		26	Reserved	NC
27	GND	GND	28	Reserved	NC
29	PETn1	PCIe Lane 1 Device Transmitter	30	Reserved	NC
31	PETp1		32	Reserved	NC
33	GND	GND	34	Reserved	NC
35	PERn1	PCIe Lane 1 Device Receiver	36	Reserved	NC
37	PERp1		38	Reserved	NC
39	GND	GND	40	Reserved	NC
41	PETn0	PCIe Lane 0 Device Transmitter	42	Reserved	NC
43	PETp0		44	Reserved	NC
45	GND	GND	46	Reserved	NC
47	PERn0	PCIe Lane 0 Device Receiver	48	Reserved	NC
49	PERp0		50	PERST#	PE-Reset
51	GND	GND	52	CLKREQ#	Clock Request
53	REFCLKn	PCIe Reference Clock	54	PEWAKE#	NC
55	REFCLKp	PCIe Reference Clock	56	MFG1	Manufacturing pin. Must be **NOT** connected on the host board.
57	GND	GND	58	MFG2	
Notch			Notch		
67	Reserved	NC	68	SUSCLK	NC
69	PEDET	NC-PCIe	70	+3.3V	3.3 V Source
71	GND	GND	72	+3.3V	3.3 V Source
73	GND	GND	74	+3.3V	3.3 V Source
75	GND	GND			

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

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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