

> XG6 SERIES CLIENT SSD

The XG6 series utilizes Toshiba Memory's latest 96-layer, 3D TLC (3-bit-per-cell) flash memory. With 4th generation BiCS FLASH™ and SLC cache features, XG6 SSDs reach up to sequential read/write speeds of 3180 MB/s and 2960 MB/s respectively and deliver up to 355,000 random read and 365,000 random write IOPS. In addition to high performance, XG6 carries on the low power design of the XG family, consuming 4.7 W or less in active mode and less than 3 mW in stand-by mode.

The new XG6 series is optimized for power-sensitive mobile PCs, performance-oriented gaming PCs, as well as data center environments for server-boot, caching and logging.

Available in a compact M.2 2280 single-sided form factor, the XG6 series comes in three capacity models of 256 GB, 512 GB and 1024 GB, each with the option of a Self-Encrypting Drive (SED) model supporting TCG Opal Version 2.01.

SSD



> KEY FEATURES

- Toshiba Memory 96-Layer BiCS FLASH™
- PCIe® Gen3*4L NVMe™
- Capacities up to 1024 GB
- M.2 2280 Single-sided
- TCG OPAL 2.01 Optional for SED*

> APPLICATIONS

- Thin performance notebook PCs
- High-performance desktop PCs
- Gaming PCs
- Server-boot, caching & logging use in data center

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

> SPECIFICATIONS

Standard Models		M.2 2280-S2 (Single-sided)		
Model Number		KXG60ZNV256G KXG6AZNV256G	KXG60ZNV512G KXG6AZNV512G	KXG60ZNV1T02 KXG6AZNV1T02
Memory		TOSHIBA BiCS FLASH™		
Interface		PCI Express® Base Specification Revision 3.1a (PCIe®)		
Maximum Speed		32 GT/s (PCIe® Gen3x4 Lane)		
Command		NVM Express™ Revision 1.3a (NVMe™)		
Connector Type		M.2 M		
Formatted Capacity ¹⁾		256 GB	512 GB	1,024 GB
Performance ²⁾ (Up to)	Sequential Read	3,050 MB/s	3,100 MB/s	3,180 MB/s
	Sequential Write	1,550 MB/s	2,800 MB/s	2,960 MB/s
Supply Voltage		3.3 V ±5 %		
Power Consumption	Active	4.0 W typ.	4.1 W typ.	4.7 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.	

Products and specifications discussed herein are for reference purposes only and are subject to change without notice. All information discussed herein is provided on an "as is" basis, without warranties of any kind. Before creating and producing designs and using, customers must refer to and comply with the latest versions of the product specifications.

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
More Features		<ul style="list-style-type: none"> · Sanitize is supported. · Namespace Management and Namespace Attachment commands are supported. · Non-Operational Power State Configuration is supported. · TCG Storage Interface Interactions Specification (SIIS) Version 1.07 is supported.
Compliance		UL, cUL, TÜV, KC, FCC, BSMI, CE, RCM, ISED, VCCI, Moroccan conformity mark

Note: 1) Definition of capacity: Toshiba Memory Corporation 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) Read and write speed, tested on the state of "SLC cache = On", may vary depending on the host device, read and write conditions, and file size.

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.

* All other company names, product names, and service names mentioned herein may be trademarks of their respective companies.

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

Products and specifications discussed herein are for reference purposes only and are subject to change without notice. All information discussed herein is provided on an "as is" basis, without warranties of any kind. Before creating and producing designs and using, customers must refer to and comply with the latest versions of the product specifications.

> ORDERING INFORMATION

	<u>K</u>	<u>XX</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>XXXX</u>
	1	2	3	4	5	6	7	8
1. Product Name								K: SSD product
2. Product Category								XG: XG Series
3. Development Generation								6: Generation 6
4. Option Code 1								0: Non-SED 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								256G / 512G /1T02 256G is 256 GB; 512G is 512 GB; and 1T02 is 1024 GB. (1 GB = 1,000,000,000 bytes)

Products and specifications discussed herein are for reference purposes only and are subject to change without notice. All information discussed herein is provided on an "as is" basis, without warranties of any kind. Before creating and producing designs and using, customers must refer to and comply with the latest versions of the product specifications.

> PRODUCT LINE UP

Model Number	Formatted Capacity	Form Factor/Connect Type	Function Note
KXG60ZNV256G	256 GB	M.2 2280-S2 ¹⁾ -M module	Non- SED
KXG60ZNV512G	512 GB		
KXG60ZNV1T02	1,024 GB		
KXG6AZNV256G	256 GB		SED ²⁾
KXG6AZNV512G	512 GB		
KXG6AZNV1T02	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 ¹⁾	500,118,192	62,514,774
512 GB ¹⁾	1,000,215,216	125,026,902
1,024 GB ¹⁾	2,000,409,264	250,051,158

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

> PERFORMANCE

Standard Models	KXG60ZNV256G KXG6AZNV256G	KXG60ZNV512G KXG6AZNV512G	KXG60ZNV1T02 KXG6AZNV1T02
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 ¹⁾ (Up to)	3,050 MB/s	3,100 MB/s	3,180 MB/s
Sequential Write ²⁾³⁾ (Up to)	1,550 MB/s	2,800 MB/s	2,960 MB/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: These values are typical and obtained in specific test environment at TOSHIBA MEMORY. These values are only for reference purpose.

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

Products and specifications discussed herein are for reference purposes only and are subject to change without notice. All information discussed herein is provided on an "as is" basis, without warranties of any kind. Before creating and producing designs and using, customers must refer to and comply with the latest versions of the product specifications.

> SUPPLY VOLTAGE

Standard Models	M.2 2280 Module
Allowable voltage	3.3 V \pm 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 protect circuit. (Rated current: 3.5 A)

> POWER CONSUMPTION

Operation (Ta ¹⁾ =25°C)	M.2 2280 Module		
	KXG60ZNV256G KXG6AZNV256G	KXG60ZNV512G KXG6AZNV512G	KXG60ZNV1T02 KXG6AZNV1T02
Read ²⁾	4.0 W typ.	4.1 W typ.	4.2 W typ.
Write ²⁾	2.4 W typ.	3.3 W typ.	4.7 W typ.
Power State 3 ³⁾	50.0 mW typ.	50.0 mW typ.	50.0 mW typ.
Power State 4 ³⁾	5.0 mW typ.	5.0 mW typ.	5.0 mW typ.
Power State 5 ³⁾	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 L1.2

Power consumption during the Admin command processing is excluded.

Products and specifications discussed herein are for reference purposes only and are subject to change without notice. All information discussed herein is provided on an “as is” basis, without warranties of any kind. Before creating and producing designs and using, customers must refer to and comply with the latest versions of the product specifications.

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: Package Surface or 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 ¹⁾	14.709 km/s ² {1,500 G}, 0.5 ms half sine wave
Non-operating ¹⁾	

> VIBRATION

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

Products and specifications discussed herein are for reference purposes only and are subject to change without notice. All information discussed herein is provided on an "as is" basis, without warranties of any kind. Before creating and producing designs and using, customers must refer to and comply with the latest versions of the product specifications.

COMPLIANCE

> SAFETY / EMC STANDARDS

Title	Description	Region
UL	UL 60950-1	USA
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
Moroccan conformity mark	NM EN 55032, NM EN 55024	Morocco
VCCI	VCCI-CISPR32	Japan

> RELIABILITY

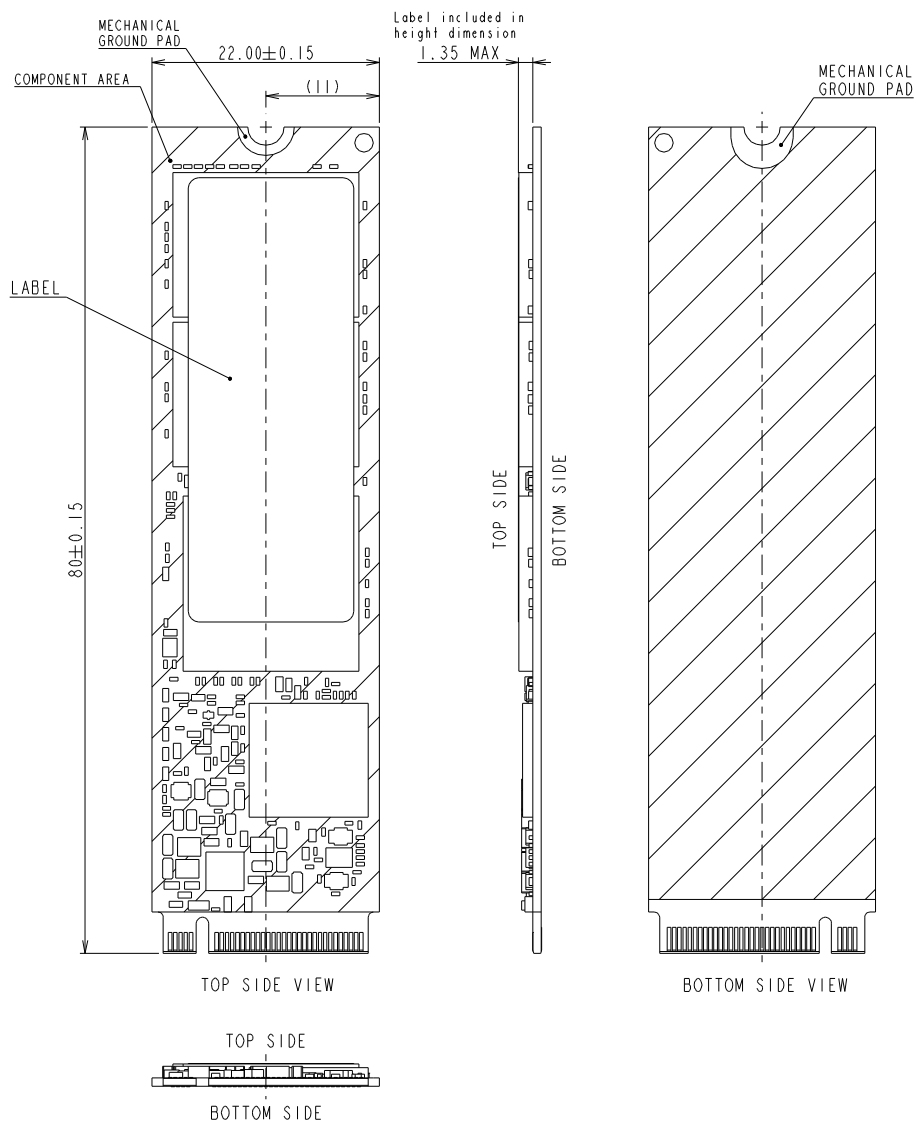
Parameter	Value
Mean Time to Failure	1,500,000 hours

Products and specifications discussed herein are for reference purposes only and are subject to change without notice. All information discussed herein is provided on an "as is" basis, without warranties of any kind. Before creating and producing designs and using, customers must refer to and comply with the latest versions of the product specifications.

MECHANICAL SPECIFICATIONS

> M.2 2280 MODULE

Model Number	Weight	Width	Height	Length
KXG60ZNV256G KXG6AZNV256G	7.0 g typ.	22.00 mm	2.23 mm	80.00 mm
KXG60ZNV512G KXG6AZNV512G	7.3 g typ.			
KXG60ZNV1T02 KXG6AZNV1T02				



Unit:mm

Figure 1: Dimensions of KXG6xZNVxxxx (M.2 2280-S2 Module)

Products and specifications discussed herein are for reference purposes only and are subject to change without notice. All information discussed herein is provided on an "as is" basis, without warranties of any kind. Before creating and producing designs and using, customers must refer to and comply with the latest versions of the product specifications.

> 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

Note: Please keep all "NC" pins as "open circuit".

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#	PE-Reset
52	CLKREQ#	Clock Request
54	PEWAKE#	NC
56	MFG1	Manufacturing pin. Must be NOT connected 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

Products and specifications discussed herein are for reference purposes only and are subject to change without notice. All information discussed herein is provided on an "as is" basis, without warranties of any kind. Before creating and producing designs and using, customers must refer to and comply with the latest versions of the product specifications.

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
0Dh	Namespace Management
10h	Firmware Commit
11h	Firmware Image Download
14h	Device Self-Test (DST)
15h	Namespace Attachment
80h	Format NVM
81h	Security Send
82h	Security Receive
84h	Sanitize ¹⁾

Note: 1) Block Erase and Crypto Erase (SED model only) is supported.

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)
11h	Non-Operational Power State Config
80h	Software Progress Marker

NVMe Command Set

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

Products and specifications discussed herein are for reference purposes only and are subject to change without notice. All information discussed herein is provided on an "as is" basis, without warranties of any kind. Before creating and producing designs and using, customers must refer to and comply with the latest versions of the product specifications.

> RESTRICTIONS ON PRODUCT USE

Toshiba Memory Corporation and its subsidiaries and affiliates are collectively referred to as "TOSHIBA". Hardware, software and systems described in this document are collectively referred to as "Product".

- TOSHIBA reserves the right to make changes to the information in this document and related Product without notice.
- This document and any information herein may not be reproduced without prior written permission from TOSHIBA. Even with TOSHIBA's written permission, reproduction is permissible only if reproduction is without alteration/omission.
- Though TOSHIBA works continually to improve Product's quality and reliability, Product can malfunction or fail. Customers are responsible for complying with safety standards and for providing adequate designs and safeguards for their hardware, software and systems which minimize risk and avoid situations in which a malfunction or failure of Product could cause loss of human life, bodily injury or damage to property, including data loss or corruption. Before customers use the Product, create designs including the Product, or incorporate the Product into their own applications, customers must also refer to and comply with (a) the latest versions of all relevant TOSHIBA information, including without limitation, this document, the specifications, the data sheets and application notes for Product and the precautions and conditions set forth in the "Reliability Information" in Toshiba Memory Corporation's website and (b) the instructions for the application with which the Product will be used with or for. Customers are solely responsible for all aspects of their own product design or applications, including but not limited to (a) determining the appropriateness of the use of this Product in such design or applications; (b) evaluating and determining the applicability of any information contained in this document, or in charts, diagrams, programs, algorithms, sample application circuits, or any other referenced documents; and (c) validating all operating parameters for such designs and applications. **TOSHIBA ASSUMES NO LIABILITY FOR CUSTOMERS' PRODUCT DESIGN OR APPLICATIONS.**
- **PRODUCT IS NEITHER INTENDED NOR WARRANTED FOR USE IN EQUIPMENTS OR SYSTEMS THAT REQUIRE EXTRAORDINARILY HIGH LEVELS OF QUALITY AND/OR RELIABILITY, AND/OR A MALFUNCTION OR FAILURE OF WHICH MAY CAUSE LOSS OF HUMAN LIFE, BODILY INJURY, SERIOUS PROPERTY DAMAGE AND/OR SERIOUS PUBLIC IMPACT ("UNINTENDED USE").** Except for specific applications as expressly stated in this document, Unintended Use includes, without limitation, equipment used in nuclear facilities, equipment used in the aerospace industry, lifesaving and/or life supporting medical equipment, equipment used for automobiles, trains, ships and other transportation, traffic signaling equipment, equipment used to control combustions or explosions, safety devices, elevators and escalators, and devices related to power plant. **IF YOU USE PRODUCT FOR UNINTENDED USE, TOSHIBA ASSUMES NO LIABILITY FOR PRODUCT.** For details, please contact your TOSHIBA sales representative or contact us via our website.
- Do not disassemble, analyze, reverse-engineer, alter, modify, translate or copy Product, whether in whole or in part.
- Product shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable laws or regulations.
- The information contained herein is presented only as guidance for Product use. No responsibility is assumed by TOSHIBA for any infringement of patents or any other intellectual property rights of third parties that may result from the use of Product. No license to any intellectual property right is granted by this document, whether express or implied, by estoppel or otherwise.
- **ABSENT A WRITTEN SIGNED AGREEMENT, EXCEPT AS PROVIDED IN THE RELEVANT TERMS AND CONDITIONS OF SALE FOR PRODUCT, AND TO THE MAXIMUM EXTENT ALLOWABLE BY LAW, TOSHIBA (1) ASSUMES NO LIABILITY WHATSOEVER, INCLUDING WITHOUT LIMITATION, INDIRECT, CONSEQUENTIAL, SPECIAL, OR INCIDENTAL DAMAGES OR LOSS, INCLUDING WITHOUT LIMITATION, LOSS OF PROFITS, LOSS OF OPPORTUNITIES, BUSINESS INTERRUPTION AND LOSS OF DATA, AND (2) DISCLAIMS ANY AND ALL EXPRESS OR IMPLIED WARRANTIES AND CONDITIONS RELATED TO SALE, USE OF PRODUCT, OR INFORMATION, INCLUDING WARRANTIES OR CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, ACCURACY OF INFORMATION, OR NONINFRINGEMENT.**
- Do not use or otherwise make available Product or related software or technology for any military purposes, including without limitation, for the design, development, use, stockpiling or manufacturing of nuclear, chemical, or biological weapons or missile technology products (mass destruction weapons). Product and related software and technology may be controlled under the applicable export laws and regulations including, without limitation, the Japanese Foreign Exchange and Foreign Trade Law and the U.S. Export Administration Regulations. Export and re-export of Product or related software or technology are strictly prohibited except in compliance with all applicable export laws and regulations.
- Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. Please use Product in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. **TOSHIBA ASSUMES NO LIABILITY FOR DAMAGES OR LOSSES OCCURRING AS A RESULT OF NONCOMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS.**

Products and specifications discussed herein are for reference purposes only and are subject to change without notice. All information discussed herein is provided on an "as is" basis, without warranties of any kind. Before creating and producing designs and using, customers must refer to and comply with the latest versions of the product specifications.