STORAGE SOLUTIONS AS INDIVIDUAL AS YOUR BUSINESS
THE COMPREHENSIVE PORTFOLIO
As an industry leader of storage products for more than four decades, Toshiba offers today’s industry’s most comprehensive range of storage technologies, from hard disk drives (HDDs), solid state hybrid drives (SSHDs) and solid state drives (SSDs) to NAND flash memories*1 – all suitable for various applications such as enterprise, mobile, factory automation and consumer environments.

**INDUSTRY-LEADING END-TO-END DESIGN**

In fact, for almost 30 years, Toshiba has also changed the world by inventing the NAND flash memory. As a global industry-leader in high-end memory technology, Toshiba has the proven engineering resources and expertise and is perfectly equipped to offer high-quality SSDs. Completely designed and produced in-house, the Toshiba SSD is equipped with the latest Toshiba NAND flash and the advanced in-house controller to deliver exceptional performance, endurance and durability. The superbly engineered Toshiba SSDs deliver faster speeds, greater durability and reliability.
With the broad spectrum of form factors, capacities, interfaces and special features, Toshiba is perfectly positioned to fulfill the individual needs and the growing demands of a variety of application sectors. Providing utmost flexibility in usage, Toshiba can be considered a true ‘One-Stop Storage Device Supplier’.

Connector (Interface)
SAS and SATA are compatible with HDDs. M.2 and U.2 are also available.

Controller
The controller is the core device of the SSD, enabling fast read/write performance, wear leveling, and enhanced reliability.

DRAM
For cache.

NAND flash memory
Data is stored in a NAND flash memory array.

NAND flash memory
In 1984, Toshiba developed a new type of semiconductor memory called flash memory, leading the industry into the next generation ahead of its competitors. Some time later in 1987, NAND flash memory (NAND) was developed, and this has since been used in a variety of memory cards and electronic equipment. The NAND market has grown rapidly, with flash memory becoming an internationally standardized memory device. Toshiba, the inventor of flash memory, has carved out a path to a new era in which we are all able to carry videos, music and data with us wherever we go.
### STORAGE PRODUCTS FOR A WIDE RANGE OF APPLICATIONS: AS FLEXIBLE AS YOUR BUSINESS

#### CLIENT HDDs & SSHDs

1. **MOBILE HDD**
   - **Performance & Capacity**
     - Suitable for high-end laptop PCs and slim desktop PCs
   - **Noise Reduction**
     - Support SATA up to 6.0 Gbit/s
   - **Extreme Temperature**
     - Up to 7,278 RPM
   - **2.5-Inch Form Factor**
   - **7 mm Height Design**

2. **MOBILE THIN HDD**
   - **Performance & Capacity**
   - Suitable for high-end laptop PCs
   - **High-Capacity**
   - **7 mm Height Design**

3. **DESKTOP HDD**
   - **Rich Capacity Line-up**
   - Up to 6 TB Capacity
   - Suitable for Desktop PC
   - **Low Power Consumption**
   - **7 mm Height Design**

4. **GENERIC DATA STORAGE HDD**
   - **High Capacity**
   - Up to 6 TB Capacity
   - **Low Power Consumption**
   - **7 mm Height Design**

#### CLIENT SSDs

1. **HGS SERIES**
   - **High Performance**
   - Combines multi-level cell (MLC) NAND flash technology and a high-performance flash controller to achieve improved storage capacity and performance
   - **Low power consumption of less than 0.1 W at 2.5-inch Mobile Mark 2012 workload**

2. **XS3 SERIES**
   - **High Performance**
   - Using Toshiba TLC NAND flash memory
   - Storage capacities up to 1,024 GB
   - 0.6 Gbit/s SATA interface
   - Engineered for desktop and notebook PCs
   - QSGE ECC technology from Toshiba for error correction and reliability

#### SSHDs

1. **HG6 SERIES**
   - **SSD-like performance**
   - Suitable for high-end laptop PCs and 2.5-inch Form Factor
   - **7 mm Height Design**
   - **Combines multi-level cell (MLC) NAND flash technology and a high-performance flash controller to achieve improved storage capacity and performance**
   - **Low power consumption of less than 0.1 W at 2.5-inch Mobile Mark 2012 workload**

2. **XS3 SERIES**
   - **High Performance**
   - Using Toshiba TLC NAND flash memory
   - Storage capacities up to 1,024 GB
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### Storage Product Specifications

#### HDDs & SSHDs

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<th>Interface</th>
<th>Low Power Consumption (MB/s)</th>
<th>Shock Voltage (V)</th>
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<td>500 - 3200</td>
<td>SATA 6.0 Gbit/s</td>
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## STORAGE PRODUCTS FOR ENTERPRISE APPLICATIONS: FREE SPACE FOR GROWTH

### ENTERPRISE SSDs

**NEW ENTERPRISE HDDs**
- For mixed workloads
- Up to 10 DWPD
- For mainstream servers
- Power Loss Protection

### VALUE ENDURANCE SSD

**LOW COST PER CAPACITY**
- 2.5-Inch Form Factor
- Superior power consumption efficiency enables TCO reduction
- Power Loss Protection

### READ INTENSIVE SSD

**MAX OF CAPACITY AND PERFORMANCE**
- 2.5-Inch Form Factor
- Up to 2 DWPD
- For mainstream servers
- Power Loss Protection

## SPECIALTY DRIVES

**HIGH CAPACITY HDD**
- Up to 3 TB Storage Capacity
- Suitable for external storage

### INDUSTRIAL HDD

**HIGH RELIABILITY AND SCALABILITY**
- Support up to 32 HD cameras
- Rotational Vibration (RV) Sensors
- Up to 5 TB Storage Capacity

### VIDEO STREAMING HDD

**HIGH CAPACITY HDD**

### SURVEILLANCE HDD

**HIGH CAPACITY HDD**

## ENTERPRISE HDDs

### 1: ENTERPRISE PERFORMANCE HDD

**MIX OF CAPACITY, PERFORMANCE AND AVAILABILITY**
- 2.5-Inch Form Factor
- Up to 15,000 RPM
- For Tier 1 enterprise servers

### 2: ENTERPRISE CAPACITY HDD

**LARGE CAPACITY**
- 3.5-Inch Form Factor
- Up to 7,200 RPM
- For Tier 2 and Tier 3 servers

### 3: ENTERPRISE CLOUD HDD

**LARGE CAPACITY**
- 3.5-Inch Form Factor
- Cost efficient
- For Tier 3 servers

### SPECIFIC APPLICATIONS:

**STORAGE PRODUCTS FOR ENTERPRISE HDDs**

**STORAGE PRODUCTS FOR SPECIFIC NEEDS**

**SPECIALISED FOR YOUR NEEDS**

## SPECIFICATIONS:

**PLP (Power Loss Protection)**

Protection against power loss in the event of unexpected power loss. Some of Toshiba Storage Products are equipped with Power Loss Protection (PLP) technology to protect against data loss in the event of unexpected power loss.

**PLP on SSD products supports to record data stored in buffer memory into NAND flash memory utilizing back electromotive force along with data rotation inertia in case of unexpected power supply down.

**PLP on HDD products supports to record data from buffer memory using the hard disk media utilizing back electromotive force along with data rotation inertia in case of unexpected power supply down quickly.

**Wipe technology** is Toshiba’s unique technology which automatically erases data when a drive is accessed by an unregistered system.

**FIPS validated modules** supports AES 256 bit cryptographic algorithm. They are designed along with the FIPS (Federal Information Processing Standard) standard, and have achieved validation to U.S. Federal Information Processing Standard 140-2 (FIPS 140-2).

**Secure Channel** is one of the mutual authentication features and generally utilized on devices which are for Set Top Box (STB) applications.

### STORAGE PRODUCTS FOR SPECIFIC NEEDS:

**STORAGE PRODUCTS FOR SPECIALISED FOR YOUR NEEDS**

**SPECIALISED FOR YOUR NEEDS**

### ENTERPRISE SSDs

**NEW ENTERPRISE HDDs**
- For mixed workloads
- Up to 10 DWPD
- For mainstream servers
- Power Loss Protection

### VALUE ENDURANCE SSD

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- 2.5-Inch Form Factor
- Superior power consumption efficiency enables TCO reduction
- Power Loss Protection

### ENTERPRISE HDDs

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As a result of repeating read/write i.e. electron injection into a floating gate of NAND memory cell, the oxide layer is degraded and this degradation causes Toshiba SSDs include Technology Geared Towards Lifetime Expansion

Refresh techniques are intended to prevent error rates getting worse and help SSDs to expand their lifetime. Error correction codes (ECC) and Refresh, ECC is redundant codes added to user data to correct errors and Refresh is a mechanism which relocates data pre defined access threshold to maintain performance. Over Provisioning method – by which the number of logical blocks assigned to the device – exceeds Wear Leveling is managed through the flash controller algorithms which monitor and reassign data blocks that are frequently accessed and have met a limitation of read/write endurance shortening a life time of SSD. Various technologies have been applied to overcome this limitation and to extend the life time of SSD. There are three major techniques widely employed with current SSDs, “Wear Leveling”, “Over Provisioning” and “ECC & Refresh”. There are three major techniques widely employed with current SSDs, “Wear Leveling”, “Over Provisioning” and “ECC & Refresh”.

Regarding the drive performance, MG04ACA400A performs much better than the drives we have previously tested."
For further information on Toshiba storage products and solutions and local sales information, please visit:

Toshiba.semicon-storage.com
Toshibastorage.com

* 1 NAND flash memory is a nonvolatile semiconductor memory.
* 2 "2.5-Inch" and "3.5-Inch" mean the form factor of HDDs or SSDs. They do not indicate drive’s physical size.
* 3 One gigabyte (GB) = one billion bytes, accessible capacity may be less and actual capacity depends on the operating environment and formatting.
* 4 A kibibyte (KiB) means 210, or 1,024 bytes, a mebibyte (MiB) means 220, or 1,048,576 bytes, and a gibibyte (GiB) means 230, or 1,073,471,824 bytes.
* 5 Product image may represent a design model.
* 6 Number of surveillance cameras support capability is defined by performance simulation with High Definition cameras as 2 MB/s rate.
* 7 DWPD (Drive Write Per Day). One full drive write per day means the drive can be written and re-written to full capacity once a day every day for five years, the stated product warranty period. Actual results may vary due to system configuration, usage and other factors.
* 8 IOPS: Input Output Per Second (or the number of I/O operations per second)
* 9 A = Advanced Format Sector (4k), E = 512byte Sector Emulated, N = 512byte Sector Native
* 9a P=4kn Q=512e
* 10 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.

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

Toshiba refers to “storage products” as products that can store data, such as SSD and HDD.

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