**Toshiba Launches Highest Density Embedded NAND Flash Memory Modules**

*e•MMC<sup>TM</sup> Compliant Embedded Memories Combine up to 64GB NAND and a Controller in a Single Package*

**Düsseldorf, Germany, 15<sup>th</sup> December, 2009** – Toshiba Corporation has announced the launch of a 64 gigabyte (GB) embedded NAND flash memory module, the highest capacity yet achieved in the industry. The chip is the flagship device in a new line-up of six embedded NAND flash memory modules that offer full compliance with the latest e•MMC<sup>TM</sup> standard, and that are designed for application in a wide range of digital consumer products, including smartphones, mobile phones, netbooks and digital video cameras. Samples of the 64GB module are available from today, and mass production will start in the first quarter of 2010.

The new 64GB embedded device combines sixteen 32Gbit (equal to 4GB) NAND chips fabricated with Toshiba's cutting-edge 32nm process technology, and also integrates a dedicated controller. Toshiba is the first company to succeed in combining sixteen 32Gbit NAND chips, and applied advanced chip thinning and layering technologies to realize individual chips that are only 30 micrometers thick. Full compliance with the JEDEC/MMCA Version 4.4 (V4.4) standard for embedded MultiMediaCards supports standard interfacing and simplified embedding in products, reducing development burdens on product manufacturers.

Toshiba offers a comprehensive line-up of single-package embedded NAND Flash memories in densities ranging from 2GB to 64GB. All integrate a controller to manage basic control

functions for NAND applications, and are compatible with the latest $e$•MMC$^{TM}$ standard and its new features, including defining multiple storage areas and enhanced security features.

Demand continues to grow for embedded memories with a controller function that minimizes development requirements and eases integration into system designs. Toshiba has established itself as an innovator in this key area. The company was first to announce a 32GB $e$•MMC$^{TM}$ compliant device, and is now reinforcing its leadership by being first to market with a 64GB generation module.

**New Product Line-up**

| Product Number | Capa. | Package | Sample Shipment | Mass Production | Production Scale |
|---|---|---|---|---|---|
| THGBM2G9DGFBAI2 | 64GB | 169Ball FBGA 14x18x1.4mm | Dec. 2009 | 1Q, 2010 (Jan.-Mar.) | |
| THGBM2G8D8FBAIB | 32GB | 169Ball FBGA 12x16x1.4mm | Feb. 2010 | 2Q, 2010 (Apr.-Jun.) | |
| THGBM2G7D4FBAI9 | 16GB | 169Ball FBGA 12x16x1.2mm | Jan. 2010 | 1Q, 2010 (Jan.-Mar.) | 3 million/ month (Total) |
| THGBM2G6D2FBAI9 | 8GB | 169Ball FBGA 12x16x1.2mm | Mar. 2010 | 2Q, 2010 (Apr.-Jun.) | |
| THGBM2G5D1FBAI9 | 4GB | 169Ball FBGA 12x16x1.2mm | Apr. 2010 | 2Q, 2010 (Apr.-Jun.) | |
| THGBM2G4D1FBAI8 | 2GB | 153Ball FBGA 11.5x13x1.2mm | 2Q, 2010 (Apr.-Jun.) | 3Q, 2010 (Jul.-Sep.) | |

**Key Features**

1. The JEDEC/MMCA V4.4 compliant interface handles essential functions, including writing block management, error correction and driver software. It simplifies system development, allowing manufacturers to minimize development costs and speed up time to market for new and upgraded products.

2. A wide product line-up supports capacities from 2 to 64GB. The high-capacity 64GB embedded devices can record up to 1,070 hours of music at a 128Kbps bit rate, 8.3 hours of full spec high definition video and 19.2 hours of standard definition video (HD and SD are calculated at average bit rates of 17Mbps and 7Mbps, respectively).

3. The 64GB device stacks sixteen 32Gbit chips fabricated with leading-edge 32nm process technology. Application of advanced chip thinning, layering and wire bonding technologies allowed Toshiba to achieve individual chips only 30 micrometers thick, and to layer and bond them in a small package. The result is the highest density embedded NAND flash memory module in the industry.
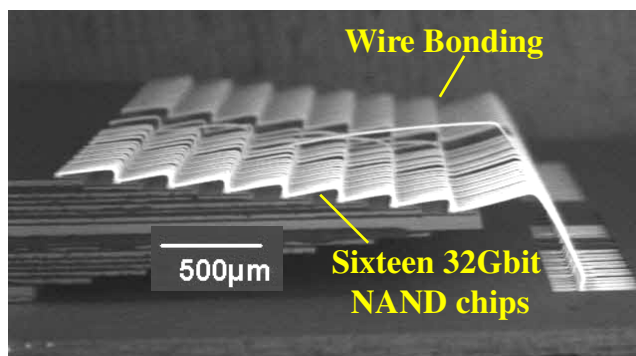
The internal structure of the 64GB module

4.  The new 64GB product is sealed in a small FBGA package which is D14 x W18 x H1.4mm and has a signal layout compliant with the JEDEC/MMCA V4.4.

**Specifications**

**e•MMC™**

| Interface | JEDEC/MMCA V4.4 standard HS-MMC interface |
|---|---|
| Power Supply Voltage | 2.7V to 3.6V (memory core); 1.65V to 1.95V / 2.7V to 3.6V (interface) |
| Bus width | x1, x4, x8 |
| Write Speed | Target 20MB per sec. (Sequential/Interleave Mode) Target 9MB per sec. (Sequential/No Interleave Mode)[*] |
| Read Speed | Target 37MB per sec. (Sequential Mode/Interleave Mode) Target 22MB per sec. (Sequential/No Interleave Mode)[*] |
| Temperature range | -25degrees to +85degees Celsius |
| Package | 153Ball FBGA（+16 support balls） |

[*] Available only for THGBM2G5D1FBAI9 and THGBM2G4D1FBAI8.

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**About Toshiba**

Toshiba Electronics Europe (TEE) is the European electronic components business of Toshiba Corporation, which is ranked among the world's largest semiconductor vendors. TEE offers one of the industry's broadest IC and discrete product lines including high-end memory, microcontrollers, ASICs, ASSPs and display products for automotive, multimedia, industrial, telecoms and networking applications. The company also has a wide range of power semiconductor solutions. TEE was formed in 1973 in Neuss, Germany, providing design, manufacturing, marketing and sales and now has headquarters in Düsseldorf, Germany, with subsidiaries in France, Italy, Spain, Sweden and the United Kingdom. TEE employs approximately 300 people in Europe. Company president is Mr. Hitoshi Otsuka.

Toshiba Corporation is a world leader and innovator in pioneering high technology, a diversified manufacturer and marketer of advanced electronic and electrical products spanning information & communications systems; digital consumer products; electronic devices and components; power systems, including nuclear energy; industrial and social infrastructure systems; and home appliances. Founded in 1875, Toshiba today operates a global network of more than 740 companies, with 199,000 employees worldwide and annual sales surpassing US$73 billion.

For more information visit Toshiba Electronics Europe's web site at www.toshiba-components.com

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**December 2009          Ref. 5975/A**