



Toshiba Memory Corporation Develops World's First QLC 3D Flash Memory

Achieves World's Largest Capacity of 1.5TB in a Single Package with BiCS FLASH™ chip

Düsseldorf, Germany, 28 June, 2017 - Toshiba Memory Corporation, the world leader in memory solutions, today announced development of the world's first^[1] BiCS FLASH™ three-dimensional (3D) flash memory^[2] with a stacked cell structure. The newest BiCS FLASH™ device is the first to deliver 4-bit-per-cell (quadruple-level cell, QLC) technology, advancing capacity beyond that of triple-level cell (TLC) devices and pushing the boundaries of flash memory technology.

Multi-bit cell flash memories store data by managing the number of electrons in each individual memory cell. Achieving QLC technology posed a series of technical challenges, as increasing the number of bit-per-cell by one within same electron count requires twice the accuracy of TLC technology. Toshiba Memory has drawn on its advanced circuit design capabilities and industry-leading 64-layer 3D flash memory process technology to create the QLC 3D flash memory.

The prototype features the world's largest die capacity^[3] (768 gigabits/96 gigabytes) with 64-layer 3D flash memory process. Shipment of prototypes to SSD and SSD controller vendors for evaluation and development purposes started in early June.

The QLC 3D flash memory also enables a 1.5-terabyte (TB) device with a 16-die stacked architecture in a single package - the industry's largest capacity^[4]. Samples of this groundbreaking device will be showcased at the 2017 Flash Memory Summit in Santa Clara, California, United States, from August 7-10.

Toshiba Memory already mass produces 64-layer 256-gigabit (32-gigabytes) devices, and as it expands mass production it will continue to demonstrate industry leadership by advancing technology development. Focused on meeting growing demand for high density, smaller chip size flash memory solutions, the new QLC device targets such applications as enterprise SSD, consumer SSD and memory cards.

Note:

[1]. Source: Toshiba Memory Corporation, as of June 28, 2017.

[2]. A structure stacking Flash memory cells vertically on a silicon substrate to realize significant density improvements over planar NAND Flash memory, where cells are formed on the silicon substrate.

[3]. Source: Toshiba Memory Corporation, as of June 28, 2017.

[4]. Source: Toshiba Memory Corporation, as of June 28, 2017.

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About Toshiba Electronics Europe

[Toshiba Electronics Europe](#) (TEE) is the European electronic components business of [Toshiba Corporation](#). TEE offers a broad IC and discrete product line including high-end memory, microcontrollers, ASICs and ASSPs for automotive, multimedia, industrial, telecoms and networking applications. The company also has a wide range of power semiconductor solutions as well as storage products including HDDs, SSDs, SD Cards and USB sticks.

TEE was formed in 1973 in Neuss, Germany, providing design, manufacturing, marketing and sales and now has headquarters in Düsseldorf, Germany, with branch offices in France, Italy, Spain, Sweden and the United Kingdom. TEE employs approximately 300 people in Europe. Company president is Mr. Akira Morinaga. For more company information visit TEE's web site at www.toshiba.semicon-storage.com.

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