

NEWS RELEASE

Irvine Headquarters
19900 MacArthur Boulevard, Suite 400
Irvine, California 92612
Telephone: (949) 623-2900, Facsimile: (949) 474-1300

MEDIA CONTACT:
Dena Jacobson
Lages & Associates
Tel.: (949) 453-8080
dena@lages.com

COMPANY CONTACT:
Rebecca Bueno
Toshiba America Electronic Components, Inc.
Tel.: (949) 623-3099
rebecca.bueno@taec.toshiba.com

25 Years of Adoption – What’s Next for NAND Flash Technology?

Reliability, Endurance, Performance of Toshiba’s Innovative Technology is Enabling Applications Beyond the Consumer

IRVINE, Calif., July 10, 2012 — [Toshiba America Electronic Components, Inc.](http://www.taec.toshiba.com), (TAEC)*, a committed leader that collaborates with technology companies to create breakthrough designs, is currently celebrating the 25th anniversary of Toshiba’s invention of NAND flash memory. For the past quarter century, this highly innovative, extensible technology has been shaping the development of products that change the way we live, work and play. NAND flash is poised to make an impact well into the future, touching everything from consumer to cloud – and beyond.

From mobile phones and MP3 players to cameras, tablets and ultrabooks, NAND flash has unleashed the mobility of content and enabled smaller and smaller form factors for the consumer electronics market, and is predicted to make just as big of an impact on the enterprise data center. When it comes to technology requirements for the enterprise, three characteristics are required: performance, endurance and reliability - all of which can be achieved using NAND in a solution designed for the rigors of the enterprise.

NAND flash in the enterprise is a rapidly moving technology segment. Early adoption of NAND flash in the enterprise was of the single-level cell (SLC) variety; however, as flash management expertise has developed there are more implementations of enterprise grade MLC (eMLC) for applications that have less endurance requirements than SLC-based solutions. Within the last two years, storage OEMs working closely with a NAND supplier have gained the expertise to implement multi-level cell (MLC) technology and today, MLC-based flash arrays are being deployed. As the cost/performance benefit of eMLC is realized in enterprise storage solutions, this trend is expected to accelerate, which underscores the importance of being on the cutting

edge of flash technology in order to meet the constantly changing and evolving needs of the data center.

According to Joseph Unsworth, Research Vice President for Gartner, “When looking at enterprise SSD supply forecasts, it is clear that the pace of NAND flash adoption in the enterprise is continuing to ramp up year over year. Our estimates show solid-state storage solutions in the enterprise space will reach 6.4 billion gigabytes by 2014 – up from 391 million gigabytes in 2011 – an annual growth rate of over 150 percent⁽¹⁾. The cost/performance of NAND flash and total cost of ownership will be the main drivers for enterprise storage in the years to come.”

The staggering amount of data projected to be stored in the cloud is driving the growth requirements of datacenters. As data centers continue to focus more and more on sustainability, the benefits of using NAND-based flash arrays will become even more evident. Not only do flash-based arrays accelerate the speed of data retrieval, total cost of ownership is considerably less with the use of NAND flash in the storage hierarchy.

According to a recent Gartner study⁽²⁾, the number of petabytes of storage that will be used over the 10-year period from 2006 – 2016 is projected to climb from 671 petabytes to more than 179 thousand petabytes. Moving forward, NAND flash-enabled solid state drives (SSDs) will migrate to flash arrays as storage tiering in enterprise applications, bringing faster access to content – while also using much less energy and drastically reducing overall datacenter footprints.

“Excessive heat and insufficient power are some of the top challenges data centers face,” noted Scott Nelson, vice president, Memory Business Unit, TAEC. “Deploying enterprise NAND based storage into data centers is a welcomed solution - NAND-based arrays and SSDs use far less power, thus requiring less cooling than traditional 15K HDD enterprise storage solutions – making them a truly ‘green’ alternative. Our understanding of market segments coupled with our ability to innovate is our strength, and our technology is designed for and optimized around the characteristics that enterprises require. There is simply no one else in the industry that knows NAND flash as well as Toshiba does.”

For more information on Toshiba memory products, please visit www.memory.toshiba.com, to read more about Toshiba’s invention of NAND flash technology please visit www.Flash25.Toshiba.com.

(1), (2) Source: Gartner – “Forecast Analysis: NAND, Worldwide, 2011-2016, 1Q12 Update,” March 2012

***About Toshiba Corp. and TAEC**

Through proven commitment, lasting relationships and advanced, reliable electronic components, Toshiba enables its customers to create market-leading designs. Toshiba is the heartbeat within product breakthroughs from OEMs, ODMs, CMs, VARs, distributors and fabless chip companies worldwide. A committed electronic components leader, Toshiba designs and manufactures high-quality flash memory-based storage solutions, solid state drives (SSDs), hard disk drives (HDDs), discrete devices, LCD displays, advanced materials, medical tubes, custom SoCs/ASICs, imaging products, microcontrollers and wireless components that make possible today's leading cell phones, MP3 players, cameras, medical devices, automotive electronics, enterprise solutions and more.

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