

## Kingston – A Leader in the Development of Fully Buffered DIMMS

With world-renowned expertise in memory engineering, manufacturing and testing, Kingston® has worked with JEDEC and Intel on FB-DIMM technology since its inception. Kingston is the only independent memory module manufacturer to invest millions in developing, testing, and manufacturing FB-DIMM memory for the next-generation servers, including the two-way Xeon servers launching in 2006.

### FB-DIMM – The New Industry-Standard Server Memory

The specifications for FB-DIMM server memory technology are developed by JEDEC, the industry's standards association. Kingston is a long-time member of JEDEC and has a position on its Board of Directors.

Pre-2006, two-way Xeon servers had limits in terms of single-rank or dual-rank DDR2 memory modules they can support, limiting upgrade flexibility and increasing cost dramatically when single-rank memory was purchased to allow for future upgrades. New solutions were needed, prompting JEDEC to develop FB-DIMM memory.

FB-DIMM memory utilizes a modified PCI Express serial bus, similar to the PCI Express technology launched in June 2004 which is used in newer graphic and other add-in cards. FB-DIMM server platforms will be able to scale memory up to 6 channels of memory, with up to 8 FB-DIMMs per channel. A full configuration, future high-end server will provide up to 48 FB-DIMM sockets, allowing for memory capacity to increase to 192 GB using 4-GB FB-DIMM modules.

### Helping IT Optimize Server TCO and Extending Server Life Cycles

FB-DIMM memory technology will offer IT purchasers unprecedented memory flexibility, lowering Total Cost of Ownership (TCO) and extending server life cycles by providing new memory upgrade options. In equivalent configurations, FB-DIMM servers will reduce memory costs significantly over older-generation server solutions while providing IT with faster servers and much higher memory capacities.

New servers with FB-DIMM memory will allow all of their sockets to be used, without any "ranks" limits. Since all memory sockets can be used, memory headroom is effectively increased and memory costs can be reduced by using cost-effective, lower-capacity memory modules instead of more expensive, high-capacity memory modules.

For example, to configure a 2005 two-way Xeon server with 16 GB of DDR2 memory, the options are to use eight 2-GB single-rank memory modules or four 4-GB dual-rank memory modules — both expensive solutions. With FB-DIMM technology, sixteen 1-GB FB-DIMMs can be used, resulting in savings of 30 percent or more in memory costs. These savings will multiply as more servers are deployed or upgraded.

In addition, a new 16-memory socket server can be deployed with eight 512-MB FB-DIMM modules for a total of 4 GB of memory; over its life cycle, the same server can be upgraded with up to eight 4-GB FB-DIMMs, resulting in a maximum of 40 GB of memory. This memory headroom allows for dynamic scaling of memory capacity to better support a server's growing workload or server consolidations using Virtualization software such as VMWare.™

### Kingston Is Ready for High-Volume Ramp

Kingston has been the only independent memory manufacturer to work with Intel and global DRAM manufacturers since 2004 to prototype, manufacture, and test FB-DIMMs. An expert in testing technology, Kingston has developed specialized and proprietary hardware testers and software to effectively test each FB-DIMM module it will ship. Kingston has also engineered special test boards and software to conduct detailed parametric and characterization testing of FB-DIMMs on high-end Automated Test Equipment (ATE) testers, thereby verifying that an FB-DIMM complies with specifications and is fully functional.

Kingston is one of the most trusted memory brands in the computer industry. In 2005, more than 80 percent of the global Fortune 100 companies purchased Kingston's memory products. Kingston has also been selected by specific global server manufacturers to be a strategic supplier of FB-DIMM memory.

Kingston is well-prepared to fully ramp the supply of its top-quality FB-DIMM memory solutions and support IT purchasers worldwide to maximize the TCO and life cycle benefits provided by the new memory technology.

