



Fully Buffered DIMM FAQ

FB-DIMM memory is now available at Kingston.

FB-DIMM (Fully Buffered Dual Inline Memory Module) memory combines high-speed DDR2 memory with a new point-to-point serial memory architecture for next-generation servers.

Read on to learn everything you need to know about FB-DIMMs.

1. What are FB-DIMMs?

Launched in April 2006, FB-DIMM is the latest server memory technology for Intel Xeon-based server platforms. Developed by Intel and standardized by JEDEC, FB-DIMMs are “intelligent” memory modules that incorporate a special memory controller built into the module.

2. Why are FB-DIMMs important to me?

FB-DIMMs are the solution for scaling memory on mid-range servers into hundreds of gigabytes within the next few years.

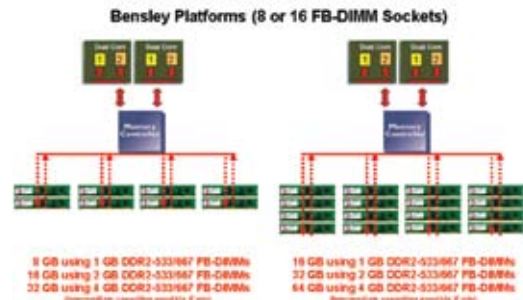
Before 2006, two-way Xeon server platforms (code-named “Lindenhurst”) were limited to a total of eight ranks of memory modules, limiting upgrade flexibility and increasing cost dramatically when single-rank higher-capacity memory modules were required. The rank limitations were due to the Registered DIMM server memory technology reaching “electrical loading” limits with higher-speed DDR333 or DDR2 memory. New DDR2 server memory architecture solutions were needed, prompting JEDEC to standardize on FB-DIMM as the next-generation server memory.

3. How does FB-DIMM technology affect IT?

FB-DIMMs resolve DDR2 memory capacity issues and enable two-way servers to reach 64GB of DDR2 memory. These servers come in 8, 12, or 16 FB-DIMM socket configurations, providing unprecedented memory flexibility. FB-DIMM allows for upgrades to a server’s memory over time, thereby increasing a server’s life

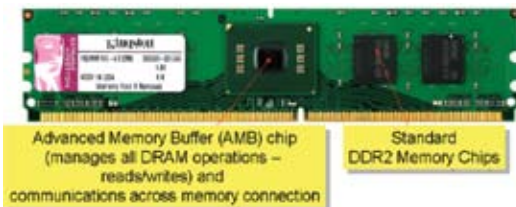
cycle while reducing the Total Cost of Ownership (TCO). With FB-DIMM servers, all memory sockets can be used, unlike Lindenhurst servers where the rank limit may require memory sockets to remain empty if the limit is reached.

The following chart shows the two major types of Bensley platforms and the DDR2 memory capacities:



4. How does FB-DIMM technology work?

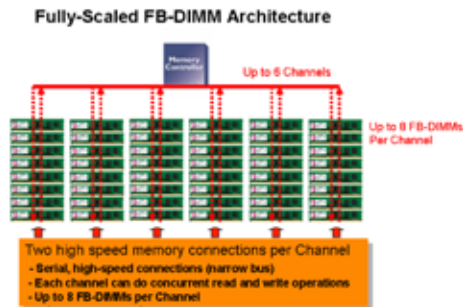
FB-DIMM technology utilizes high-speed serial (narrow bus) memory connections, similar to the PCI Express technology launched in June 2004. FB-DIMMs feature a built-in intelligent controller, called Advanced Memory Buffer (AMB), which manages all the module’s DRAM read and write operations while also handling all communications across the high-speed connection to the memory controller. FB-DIMMs are “intelligent” memory modules.



FB-DIMMs utilize the same DDR2-533 and DDR2-667 DRAMs that are already being utilized on newer desktops and notebooks (Bensley platforms support both DDR2-667 and DDR2-533 memory).

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Future FB-DIMM server platforms will be able to scale memory up to 6 channels, with up to 8 FB-DIMMs per channel. At full configuration, future high-end servers will provide up to 48 FB-DIMM sockets, allowing for memory capacity to increase to 192GB using 4GB FB-DIMM modules.



5. Why do FB-DIMMs use a heatspreader?

The Advanced Memory Buffer (AMB), the intelligent chip that manages the communications on the FB-DIMM memory module, is a controller or specialized processor. It gets hotter than DRAMs and the heatspreader helps to dissipate heat away from the AMB and DRAM chips by providing a larger area that can be cooled by a server's built-in fans. All of Kingston's FB-DIMMs will incorporate a full-DIMM heatspreader to increase their operational reliability.

6. What is the AMB chip and why is it necessary?

The AMB chip, or Advanced Memory Buffer chip, is a specialized processor (or controller) that is built into every FB-DIMM module. It allows the server motherboard's Memory Controller to "outsource" the DRAM management functions to the AMB chip. Through this outsourcing process, many of the electrical loading issues impacting Registered DIMM server modules get resolved.

In addition to managing all the FB-DIMMs' read from and write to DRAM operations, the AMB also manages communications across the high-speed memory connections linking the Memory Controller to all the FB-DIMMs in a channel.

7. Will FB-DIMMs cost more than the existing registered DIMM server memory modules?

In equivalent configurations with 8 or more GB of DDR2 memory, Bensley servers will generally reduce memory costs significantly over older-generation Lindenhurst servers.

Bensley servers will allow all of their FB-DIMM sockets to be used so memory capacity headroom is effectively increased. For example, to configure a Lindenhurst server with 16GB of DDR2 memory, the options are to use eight 2GB single-rank memory modules or four 4GB dual-rank memory modules – both expensive solutions due to higher DRAM costs. On Bensley platforms with sixteen FB-DIMM sockets, sixteen 1GB FB-DIMMs can be used, resulting in significant savings. With FB-DIMM, memory, costs can be reduced by using cost-effective, lower capacity memory modules instead of more expensive, high-capacity memory modules.

8. When is the market going to fully adopt FB-DIMM technology?

FB-DIMM technology launched on all new Intel Bensley platforms in 2006, and on new Intel Xeon MP platforms in 2007. JEDEC is already standardizing FB-DIMMs for the next-generation server platforms. Kingston expects FB-DIMMs to rapidly become the server memory standard in the next couple of years.

9. How does Kingston differentiate itself from other independent memory vendors?

Kingston is 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 prior to customer shipment. 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 has already been selected by leading server manufacturers as 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 its partners and IT purchasers worldwide in maximizing the TCO and life cycle benefits provided by the new Intel Bensley platforms.