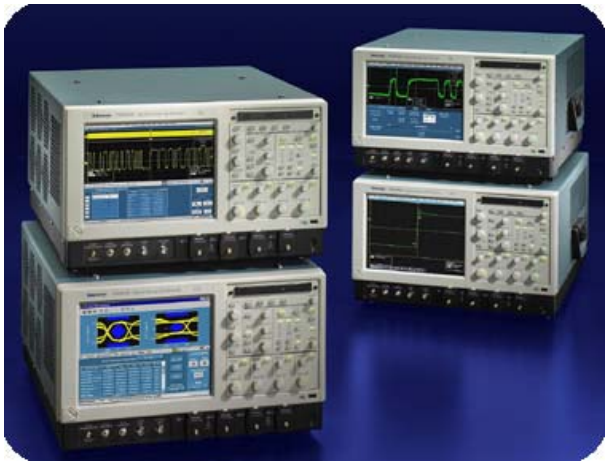
NEC Electronics Taps World's Fastest Oscilloscope, Tektronix TDS6000C and RT-Eye Test Software to Gain Early Market Advantage with AMB required for FB-DIMM Devices



Solution Summary

Challenge	In the development of AMB, NEC needed to quickly develop applied technology for implementing its existing high-speed signal processing technology acquired at developing high-end servers with low-cost and low-power requirements.
Solution	NEC utilized the fastest real-time oscilloscopes available in the market and matching software modules for compliance tests.
Benefits	With the press of a single button, NEC was able to immediately conduct measurements that would have been difficult and taken a tremendous amount of effort if they had been done through typical manual methods. As a result, NEC was able to accelerate development of AMB samples very quickly.

The First to Launch the Key Device of Next-Generation Memory Modules into the Market
NEC Electronics Corporation (Headquarters: Kawasaki City, Japan) is a huge IDM (Integrated Device Manufacturer) responsible for the semiconductor business centering on LSIs within the NEC Group. Sales exceed 700 billion yen per year (~$6 billion U.S.), and employs more than 23,000 employees (both as of March, 2005). The Server Systems Division handles operations in the development of ASSPs and ASICs related to PCI-Express, Serial-ATA, and other technologies. Within these operations is the ASSP No. 3 Project, led by Mr. Susumu Yasuda, who is in charge of developing the AMB (Advanced Memory Buffer) - a key device necessary for FB-DIMM (Fully Buffered DIMM), a high-speed next-generation memory module. FB-DIMM, which was proposed by Intel Corporation, is currently undergoing standardization through the JEDEC (Joint Electron Device Engineering Council) under the standards of the high-speed DRAM module. The existing DIMMs (Dual Inline Memory Modules) have used parallel DDR technology to communicate with memory controllers. As data rates have become faster, it has been increasingly difficult to absorb skews between signals, underscoring that limits had been reached in terms of capacity bottlenecks. With FB-DIMM, increased signal speed and memory capacity became possible by buffering signals between the memory controller and DRAMs. This is done by converting the parallel DDR-2 DRAM signals to serial point-to-point signals and then converting the serial information from the memory controller to parallel data. An advantage of FB-DIMM is that the existing DRAM can be used for memory, but as mentioned above, it is necessary to convert the parallel signals of the memory and the serial signals of the controllers, using a special LSI device – AMB.

NEC Electronics is proud of being the first company that has launched ICs for high-speed interfaces such as USB and PCI-Express into the market, and also for the innovation in creating the AMB samples for FB-DIMM. By doing so, NEC has been meeting the demands of DIMM manufacturers.

A New Business Model Backed by Its Own Technologies NEC Electronics has developed extensive high-speed signal processing and transmission technologies for high-end servers. The techniques used in equalizers for compensating for the problems of losses in transmission channels for signals that surpass 5 GHz are one example. However, most of what Mr. Yasuda has been working on so far is high-end host-side devices, where their existing advanced technology can be utilized.
On the other hand, FB-DIMM is a component of which enormous quantities of shipments are anticipated and, naturally, cost demands are severe. Therefore, the team needed to “create a new

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business model which applies our existing technologies," said Mr. Yasuda on behalf of his team. Furthermore, the AMB had to maintain 1.5V at high speed of 4.8Gbps and low power requirements. Therefore, the AMB needed a stable and advanced design that slowly shears off excess parts with the circuit design of SERs/DESs (serial/parallel converter circuits) that were located in various areas of the interior, while meeting necessary performance needs.

Additionally, it was clear that there would be competition with other manufacturers in developing a device that meets an open standard like FB-DIMM. That is why it was necessary to develop it in a short period of time and release it into the market as soon as possible.

"It took us almost half a year to get started on development after Intel proposed it," said Yasuda. Consequently, even more speed and accuracy was needed in development.

Members of ASSP No.3 project team

The Key in Developing a High-Speed Device in a Short Period of Time

High-speed oscilloscopes and logic analyzers are essential tools in the development of high-speed devices. The use of the fastest real-time oscilloscopes was a fundamental decision for Mr. Yasuda's team. The team chose the TDS6000B and TDS6000C real-time oscilloscopes for development of the AMB for FB-DIMM.

A large part of the design challenge was to recover the clock from the serial data stream. "Since the embedded clocking method for embedding signals into the clock was adopted for the FB-DIMM, it was necessary to recover the clock from the signal when measurements were being made. When recovering the clock, the long memory and the equal to processing capability to the PLL characteristics specified by the FB-DIMM standard were necessary. "The ability of the TDS6000 series and RT-Eye test software to meet this need was one of the reasons for adoption."

FB-DIMM signal measurement using P7313 prove

It was also necessary to carefully confirm whether or not the FB-DIMM standard was being adhered to by using mask tests during development. By Tektronix providing a compliance analysis module for FB-DIMM as an addition for the RT-Eye test software during the early stages, operating efficiency was raised and that facilitated the forming of technology aimed at mass production. When asked for the team members' opinions upon using TDS6000 series and the software at the end, they replied, "Handling the software was easy, so the same results can be achieved no matter who used it." "The software was great, as it precisely conformed to the latest standards." "The scope easily performed processes such as the characterization of jitter." "The wide probe variation and the precise signal pickup made it very dependable in our development activities."