Media Fact Sheet

Embedded Instrumentation Gains Broad Traction Across the Electronics Industry

Chip vendors, ATE suppliers and system manufacturers deploy embedded instrumentation in a wide range of applications

May 13, 2008 – Embedded instrument technology is attracting the attention of technology suppliers and manufacturers from all corners of the electronics industry. The reasons for this are varied and quite compelling. For example, an article in EE Times (Feb. 5, 2007) pointed out that as chip-to-chip interconnects on printed circuit boards and in System-in-Packages (SiP) approach speeds of 6 gigabits per second (Gbps) or higher, there is so much loss and distortion in the signal that the connections "can no longer be tested using conventional methods." PCI Express is now pushing 5 GHz frequencies and it could soon be clocked at 8, 10 or 12 GHz. A next-generation Fibre Channel is being developed with a speed of 8 Gbps and the article explains that IEEE 802.3ba is defining a standard for 100Gbps Ethernet.

To validate signal integrity and test these high-speed serial buses and interconnects system designers and manufacturers are turning to embedded instrumentation to determine where the sources of noise, distortion and interference may be, since these factors can bring a system-on-a-chip or a circuit board to its knees. An article in Test & Measurement World (March 1, 2007) on signal integrity validation pointed out that "the higher a signal's frequency, the more susceptible it is to degradation. Digital signals, especially those over 1 Gbps, lose amplitude and accumulate jitter as they travel through connectors, printed circuit board (PCB) traces, vias, IC pins, and cables. Thus, the transmission channels "offend" (i.e. distort) a signal's integrity…Signal integrity engineers look at how noisy power supplies affect the quality of signals. Noise on a power supply, for example, can add jitter to clock signals."

In discussing the vagaries of validating and testing systems-on-a-chip (SOCs) which are growing increasingly complex, an article in EDN magazine (Feb. 21, 2008) said, "As critical circuits reach gigahertz frequencies, it becomes physically impossible to get an accurate representation of signals off the die, even if you can probe the circuit. Yet the need remains. Chip designers must be able to observe and stimulate individual blocks in an SOC (system on chip) to bring up the silicon. Manufacturing-test engineers must be

able to create fast test programs on affordable test equipment…The only apparent option is to move test-and-measurement instruments…onto the chip itself."

To come to terms with this situation, technology vendors have implemented embedded instrumentation in several shapes and forms. Likewise, system manufactures have been compelled to deploy embedded instruments in order to perform design validation, test and debug.

The following are some examples of how embedded instrumentation technology is rapidly proliferating in the electronics industry and the focus that each particular company is taking with regards to embedded instrumentation.

- **Intel**: Focus on platform validation for its customers -- IBIST is Intel's next-generation embedded instrumentation technology which is being deployed throughout the company's high-end chips and chipsets. ASSET's ScanWorks platform was the first and is still the only third-party open tools platform that supports IBIST.

- **Synopsys**: Focus on chip test during design and, as a complement, support automatic test equipment (ATE) systems during chip manufacture -- The DesignWare® Verification Library consists of embedded instrumentation intellectual property (IP). Some of the modules in the library integrate into Verilog, SystemVerilog, OpenVera and VHDL testbenches to generate and respond to bus traffic, check for protocol violations and generate coverage reports that can be incorporated into chip designs. Instruments like digital and analog converters, pattern matchers and generators, voltage and phase controllers, limit comparators and others are included to provide test coverage within chips, not just at the pins.

- **Rambus**: Focus on complementing ATE processes -- This memory company has integrated a programmable pseudorandom-pattern generating instrument and bit-stream comparators into I/O blocks on its memory chips. This was prompted by high-speed receivers that make it virtually impossible to see what is going on inside a memory block.

- **Xilinx**: Focus on customer board validation -- This company's ChipScope Pro real-time debug and verification tool inserts logic analyzer, bus analyzer, and virtual I/O instruments directly into an FPGA, allowing the engineer to view any internal signal or node, including embedded hard or soft processors.

- **Altera**: Focus on supporting PCB designers early in the design process -- Altera recently made its Pre-emphasis and Equalization Link Estimator (PELE) available to EDA companies such as Mentor so that designers could embed PELE and deploy it in signal integrity applications on Altera's Stratix® II GX FPGAs.

- **Vitesse Semiconductor**: Focus on signal integrity validation -- This networking/communications chip vendor has devised a two-channel approach to obtain an eye diagram or other instrumentation plots that validate the performance of high-speed receivers. The primary channel is set up as the center of the eye diagram while the secondary channel collects phase and amplitude data to populate the diagram and compute bit error rates.

- **Maxim**: Focus on embedded system-level monitoring -- A family of power managers from this chip company features monitoring instrumentation so that the devices can monitor, sequence, track and margin multiple system voltages, adjusting voltages according to pre-programmed limits and storing fault data for further analysis.

- **DAFCA**: Focus on chip design -- DAFCA is an EDA software company with tools that allow chip design teams to seamlessly incorporate compact and reconfigurable instrumentation from this company's IP library.

- **Logic Vision**: Focus on IC design and support ATE systems -- This chip tools company's ET*Serdes* product is described as an embedded SerDes loop-back solution that structurally characterizes the parameters which determine signal eye distortion tolerances, verifying the parameters designers consider during a SerDes core design.

The list above is by no means complete or comprehensive. Several others companies, including Tundra, Texas Instruments, LSI, Avago and others are also providing embedded instrumentation technology.

#######

MEDIA CONTACTS:

Bob Greenfield, G&A PR 972/254-2887 bob.greenfield@verizon.net
Alan Sguigna, ASSET 972/664-3105 asguigna@asset-intertech.com