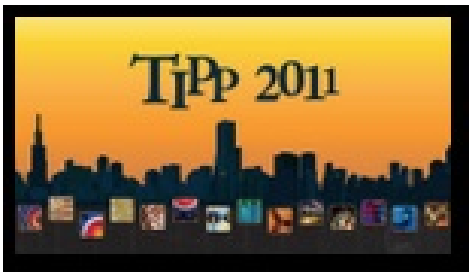

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HIPPO, a Flexible Front-End Signal Processor for High-Speed Image Sensor Readout

Friday 10 June 2011 14:00 (30 minutes)

The High-Speed Image Pre-Processor with Oversampling (HIPPO) is a prototype image sensor readout integrated circuit designed for both high performance and enhanced flexibility. HIPPO's initial target application is the instrumentation of bufferless, column-parallel, soft x-ray Charge-Coupled Device (CCD) image sensors operating at column rates up to 10 MHz, enabling 10,000 frames-per-second video rates. HIPPO's architecture is flexible and allows design tradeoffs between speed, accuracy, and area. This architectural flexibility will enable the fast development of related image sensor and particle detector readout ICs based on HIPPO technology. HIPPO is implemented in 65 nm CMOS and contains 16 readout channels, each comprising a charge amplifier, a dual-slope correlated double sampler, a sample-and-hold, a 12-bit, 80 MS/s Pipelined ADC (one ADC for every 4 channels), and a 480 Mb/s output serializer.

HIPPO achieves 35 e- read noise at 10,000 fps for a 1 Mpixel sensor, improving to 25 e- at 5000 fps. HIPPO implements oversampling to allow the user to select a point on the power/performance curve based on operational requirements. HIPPO's charge-domain input obviates the source follower amplifier used in most CCDs and enables the implementation of a fully column-parallel CCD architecture. HIPPO was also specifically designed to be adaptable in both the sequencing of its operations and in its ability to accommodate input rates potentially varying over an order of magnitude.

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