



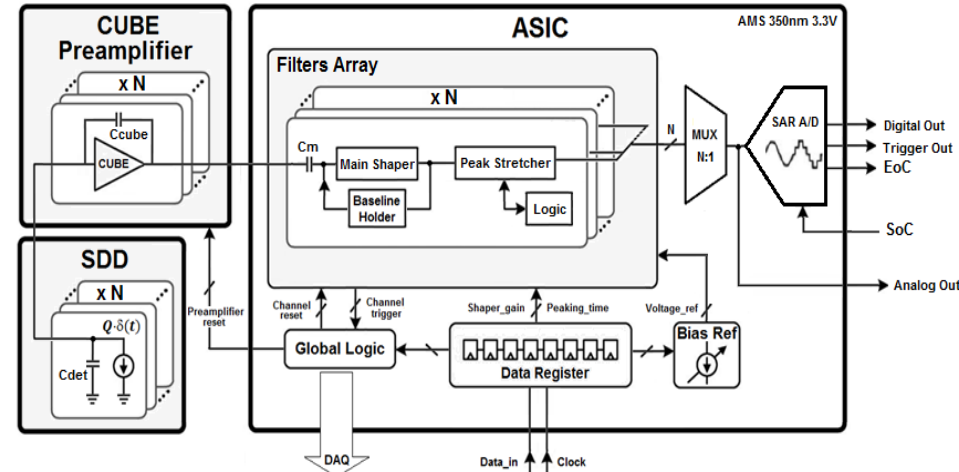
A 12-bit SAR ADC Integrated on a Multichannel Silicon Drift Detector Readout IC



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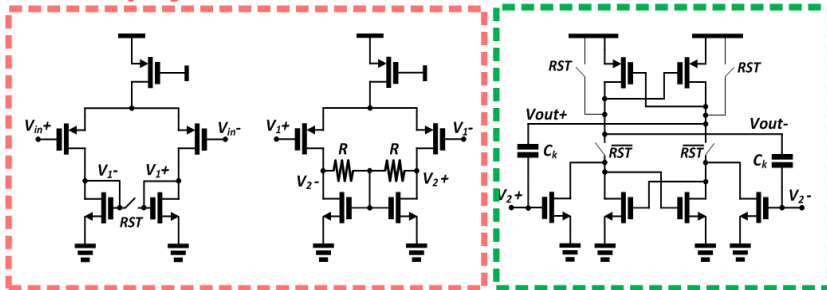
- **Target application:** compact X and γ -ray spectroscopy /imaging detection modules
- **Task of the ADC:** digitization of multichannel ASICs output multiplexed data
- **Specifications:** 5 MSps sampling speed, 11-bit accuracy
- **Architecture:** fully-differential charge-redistribution (CR) successive approximation register (SAR)
- **Building blocks:** capacitive arrays (CAP-DAC), comparator , SAR logic
- **Binary search algorithm:** monotonic (power consumption saving)



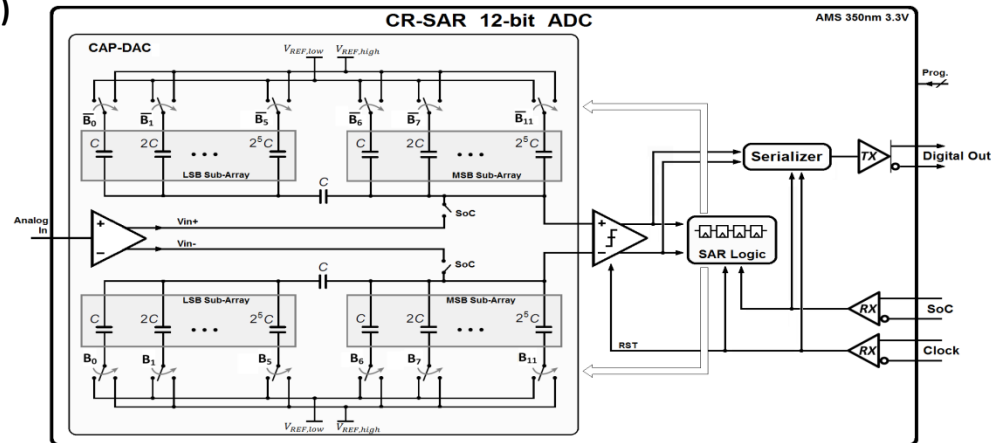
Example of readout front-end block diagram.

Preamplifier

Latch



Comparator simplified schematic.



On-chip CR-SAR ADC block diagram.



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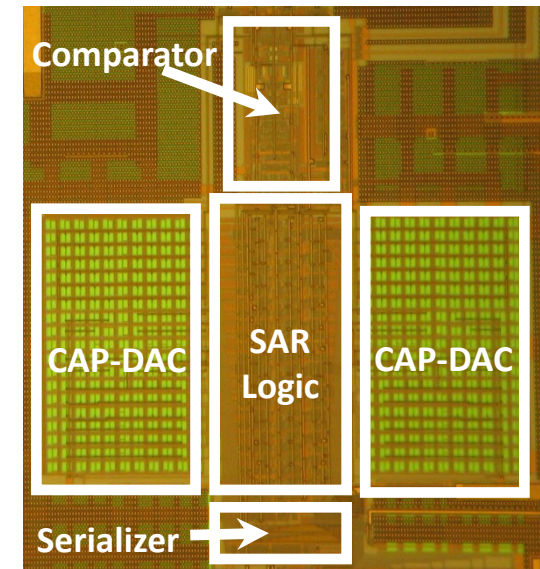


- IC fabricated in AMS 0.35 μm CMOS technology
- Area occupancy: 0.42 mm^2
- Linearity performance are obtained by applying an input voltage ramp and evaluating the digital output (the static input-output characteristic)
- Data post-processing performed with commercial National Instruments hardware

CONCLUSIONS

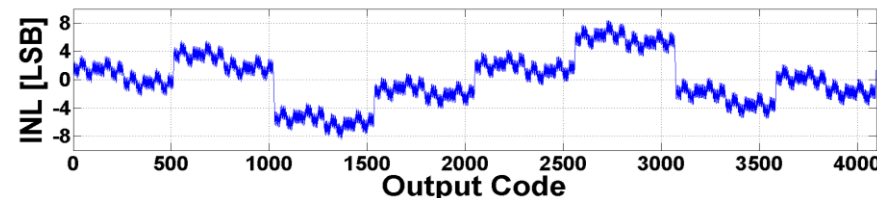
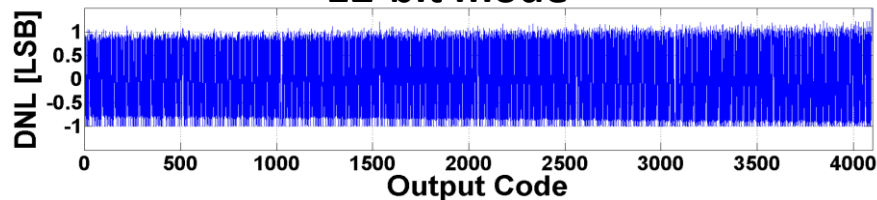
The converter proved to be a good candidate as an ADC to be integrated in multichannel ASICs for radiation detectors readout

11-bit operation is also feasible, with a slight improvement in the conversion rate and anyway ensuring sufficient resolution for the applications it addresses.

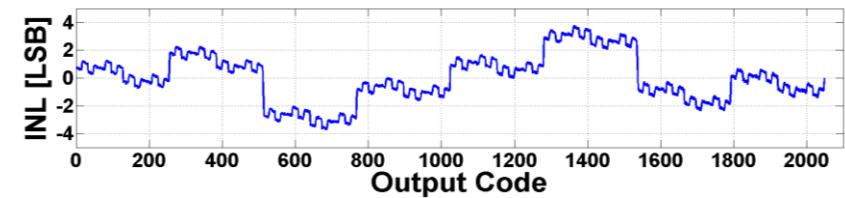
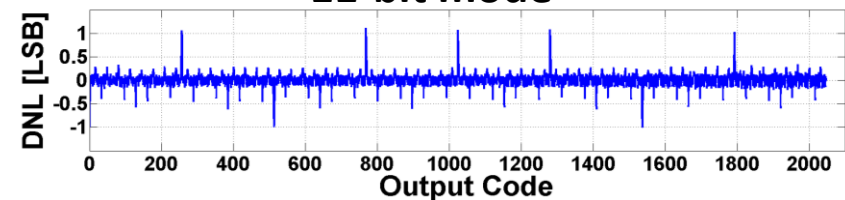


Die photograph of the CR SAR ADC.

12-bit mode



11-bit mode



Measured DNL (top) and INL (bottom) of the SAR ADC for both 12 (left) and 11-bit (right) operational modes.