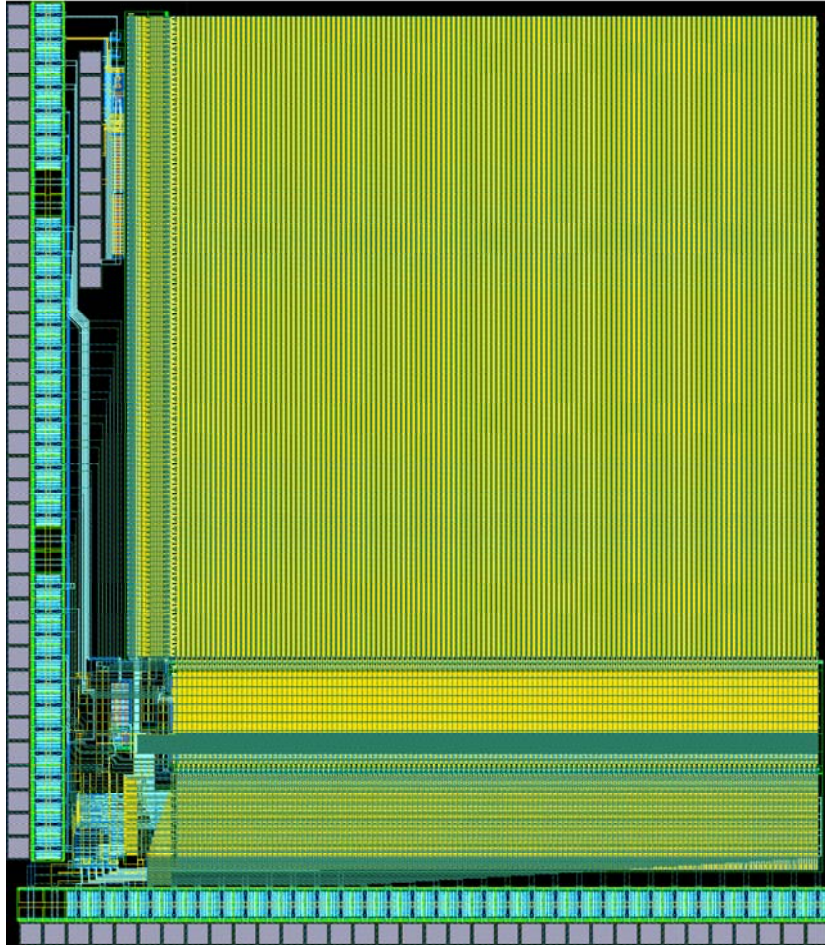

A large monolithic pixel detector in HV CMOS technology

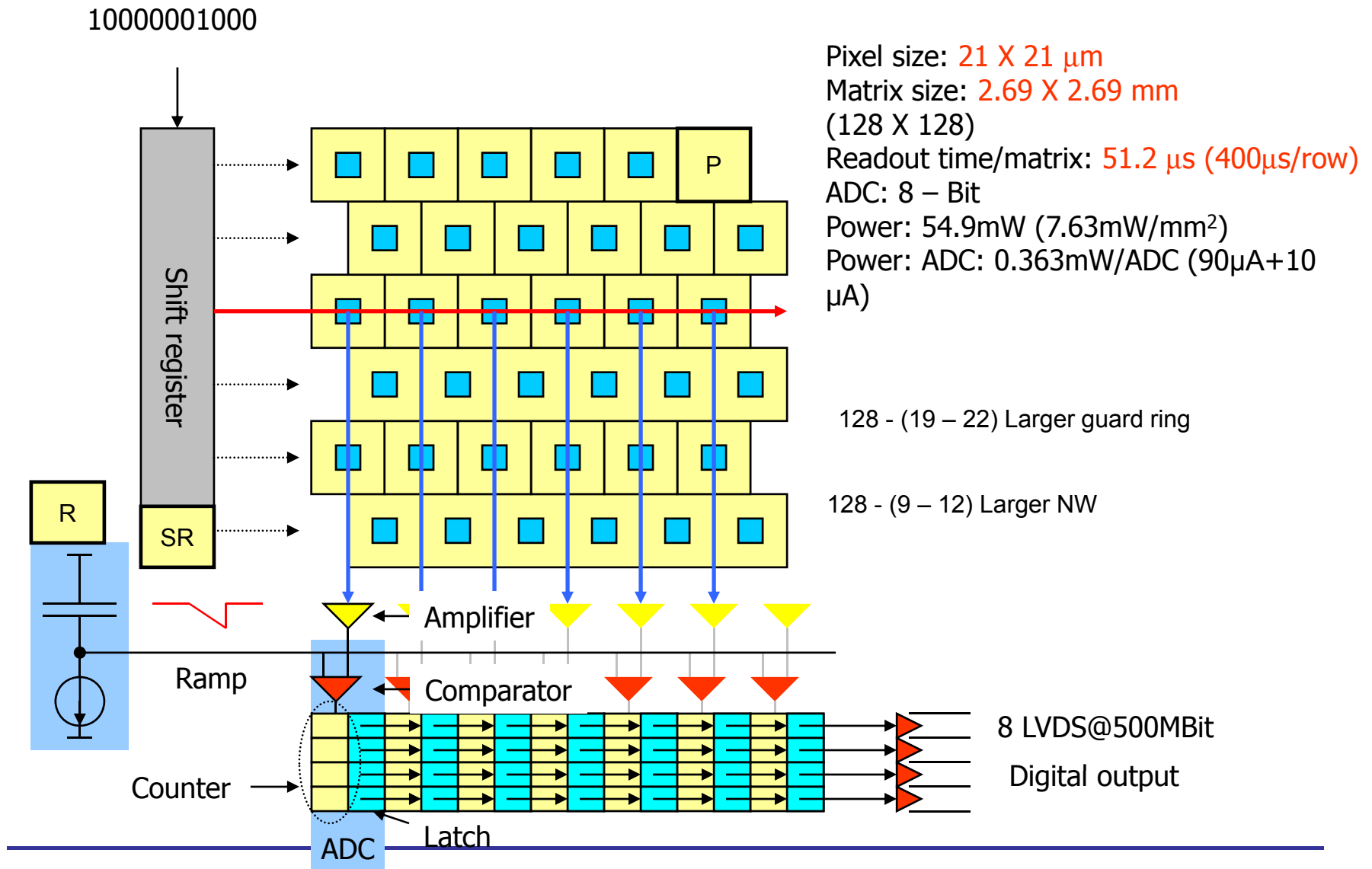
Ivan Peric
Institute for computer engineering
University of Heidelberg
Germany

Chip layout

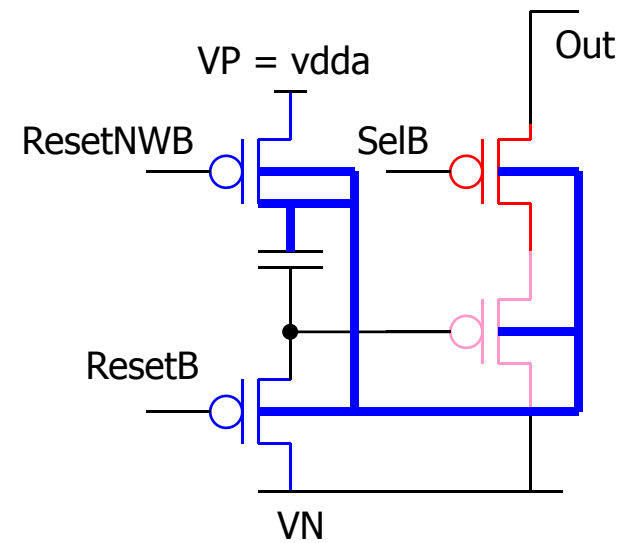
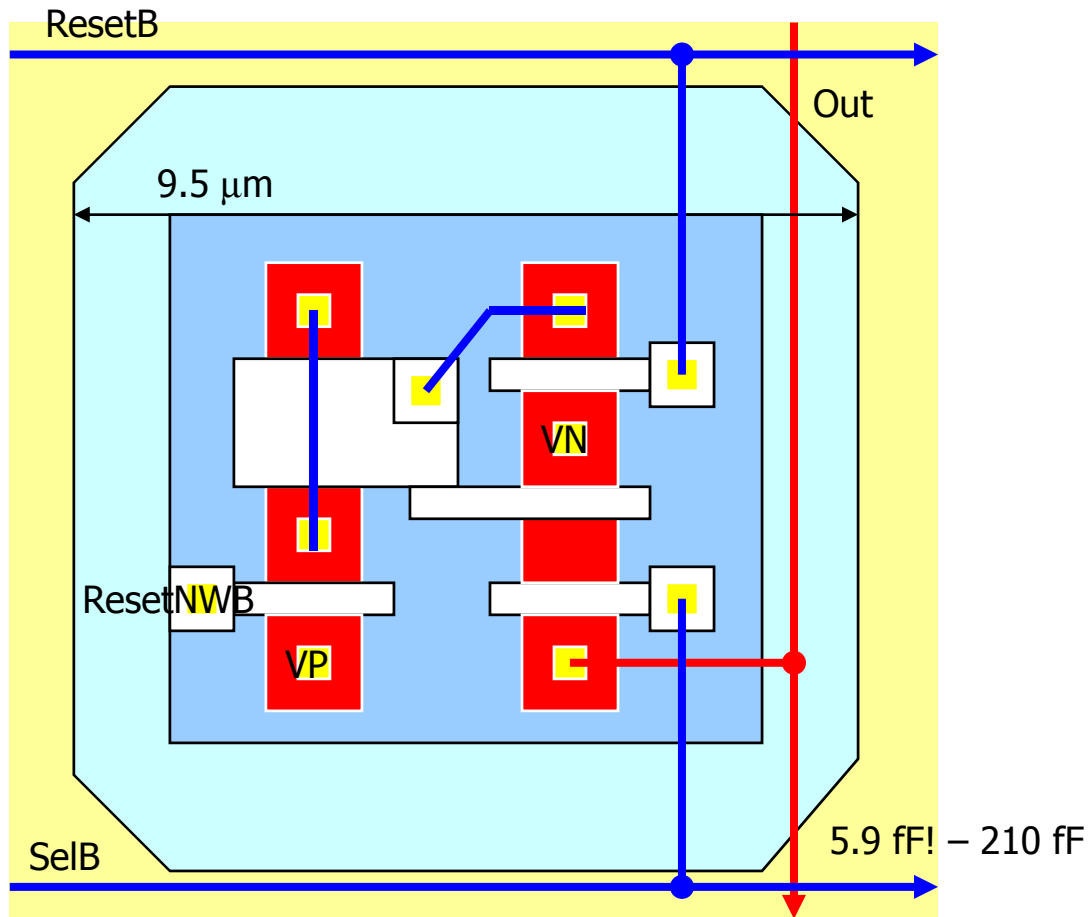


0.35 μm HV CMOS technology

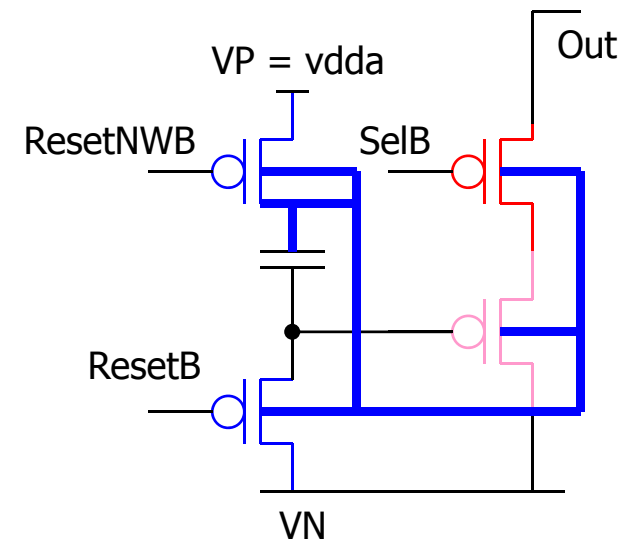
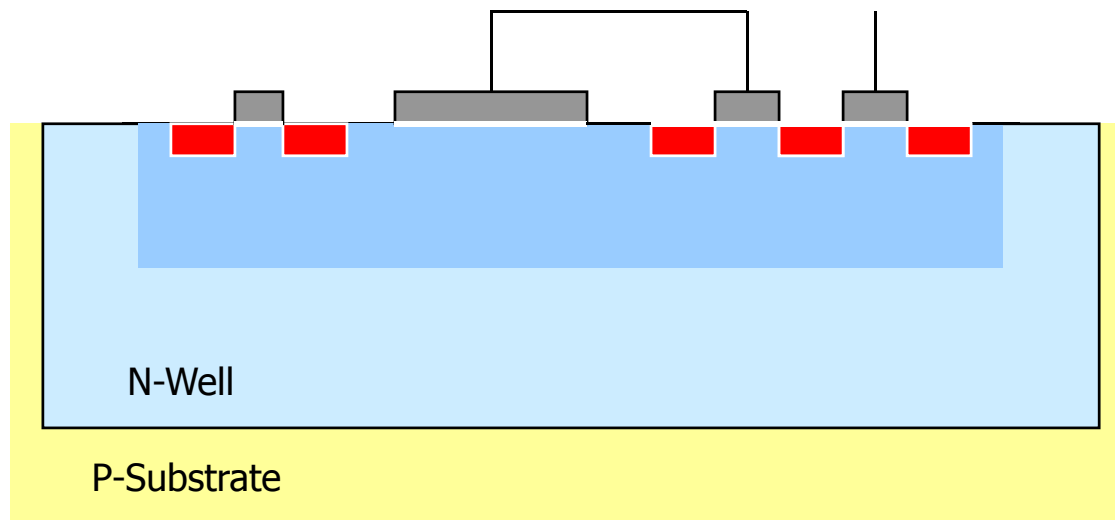
Chip structure



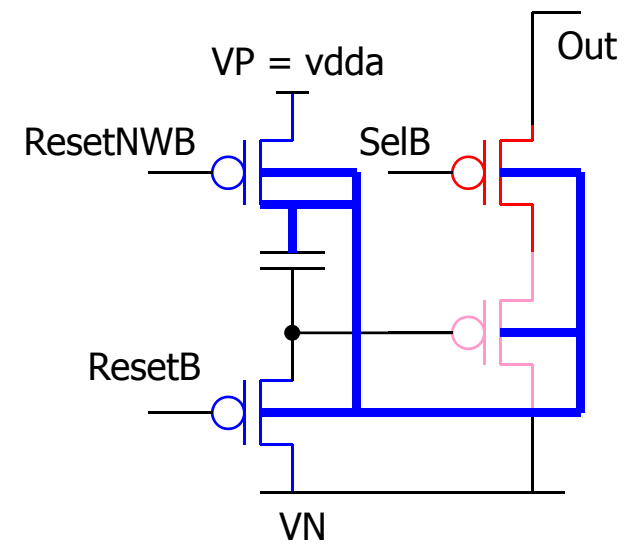
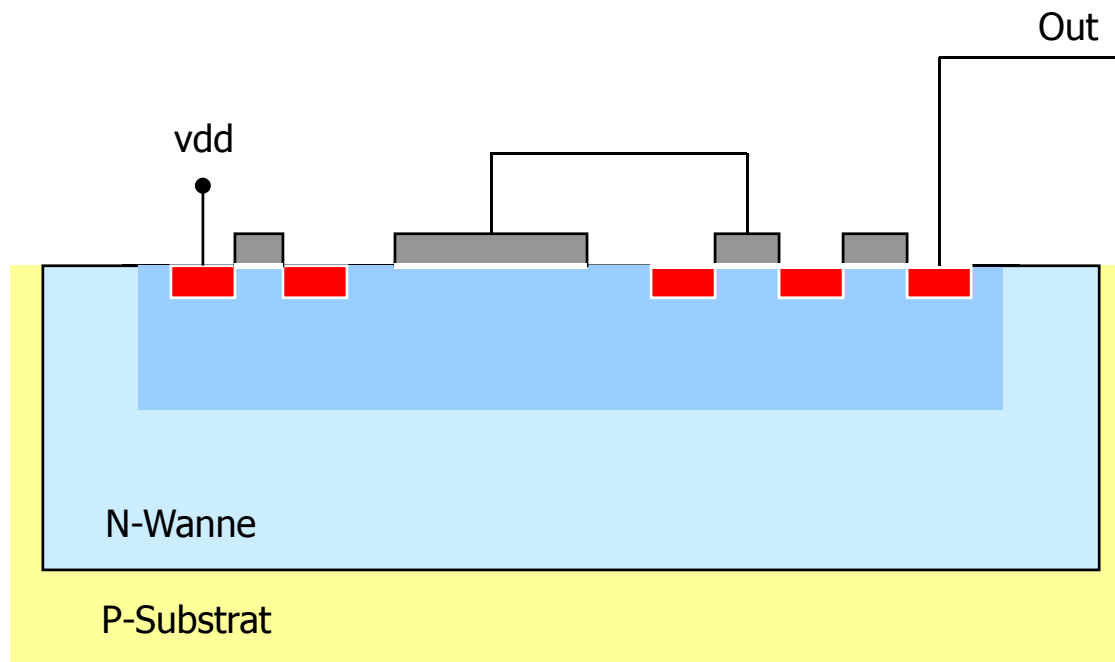
Pixel structure



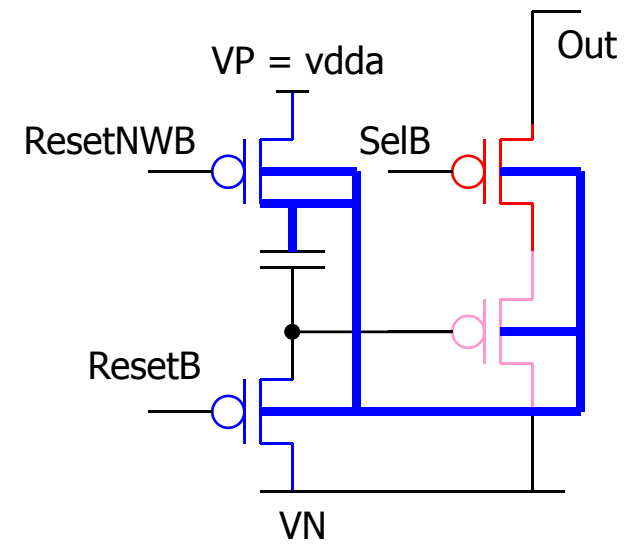
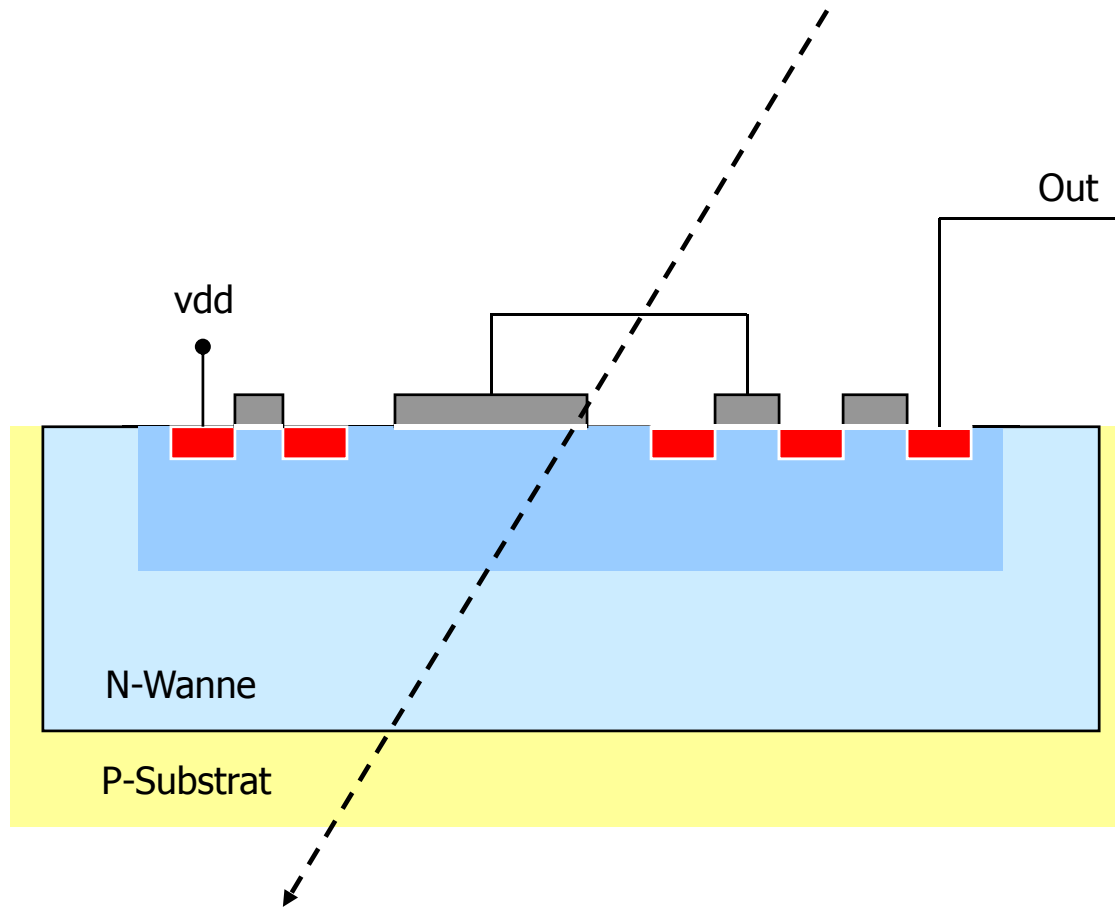
Pixel cross-section



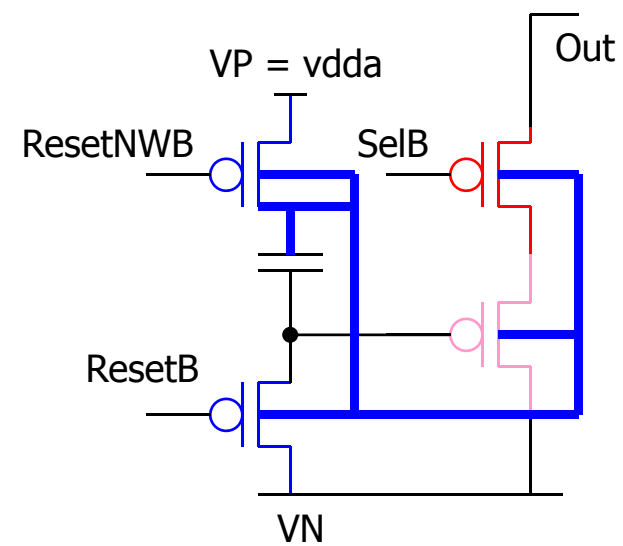
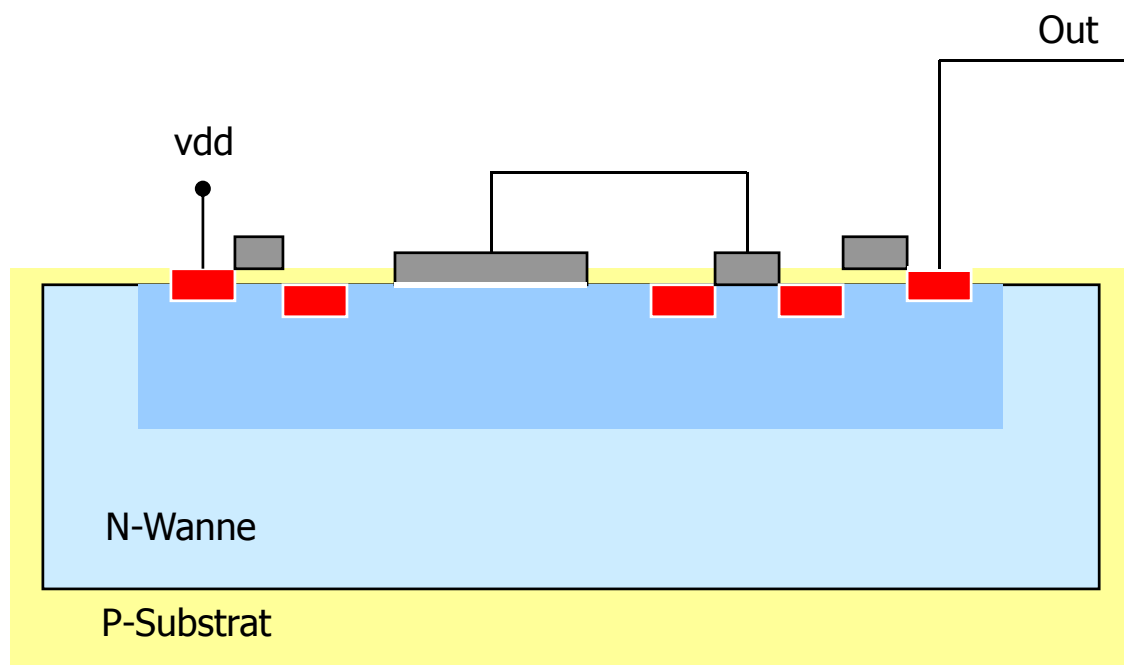
Pixel – signal generation



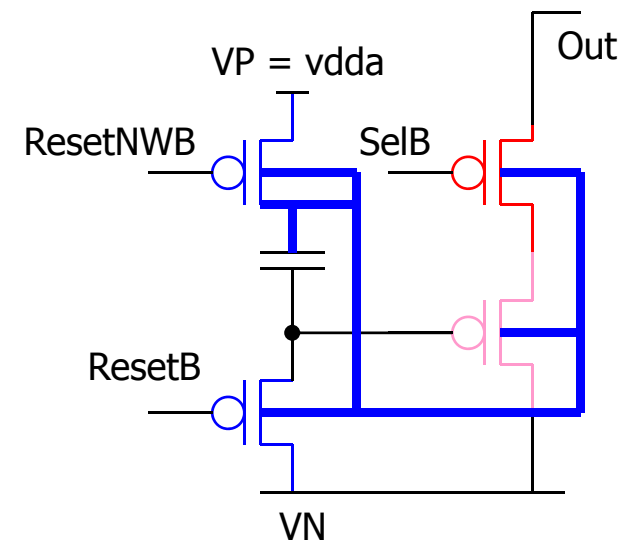
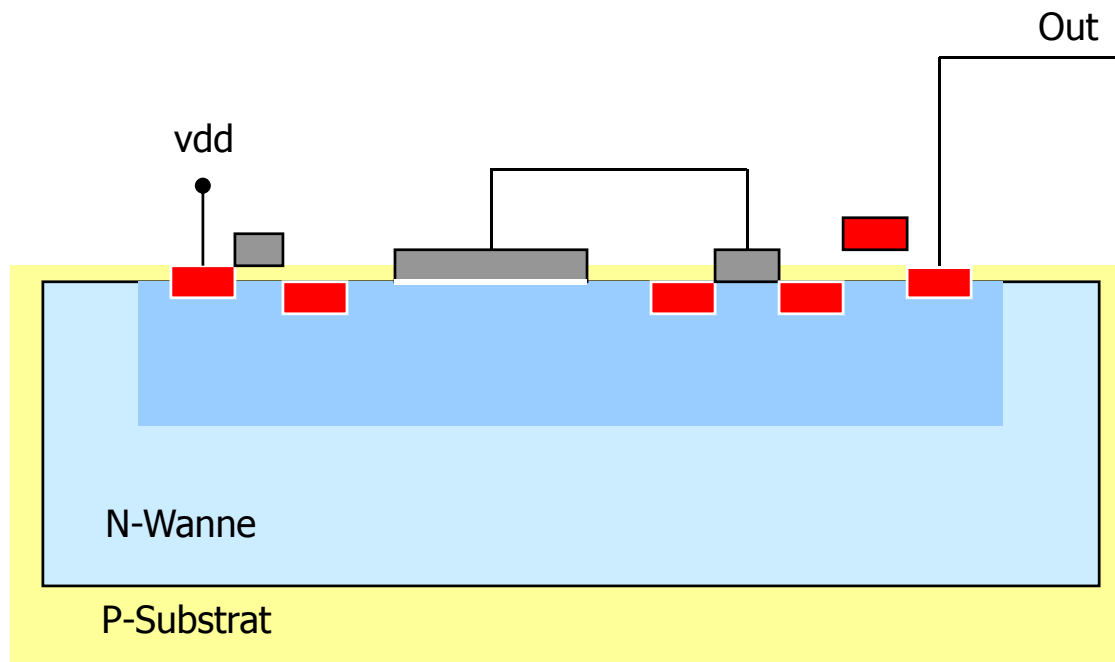
Hit



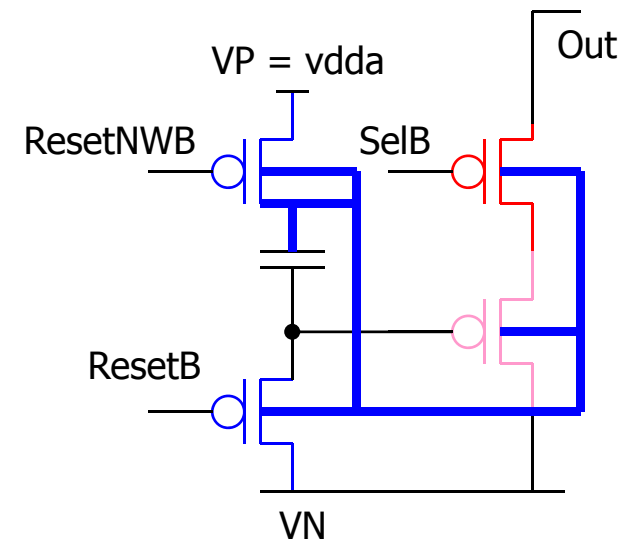
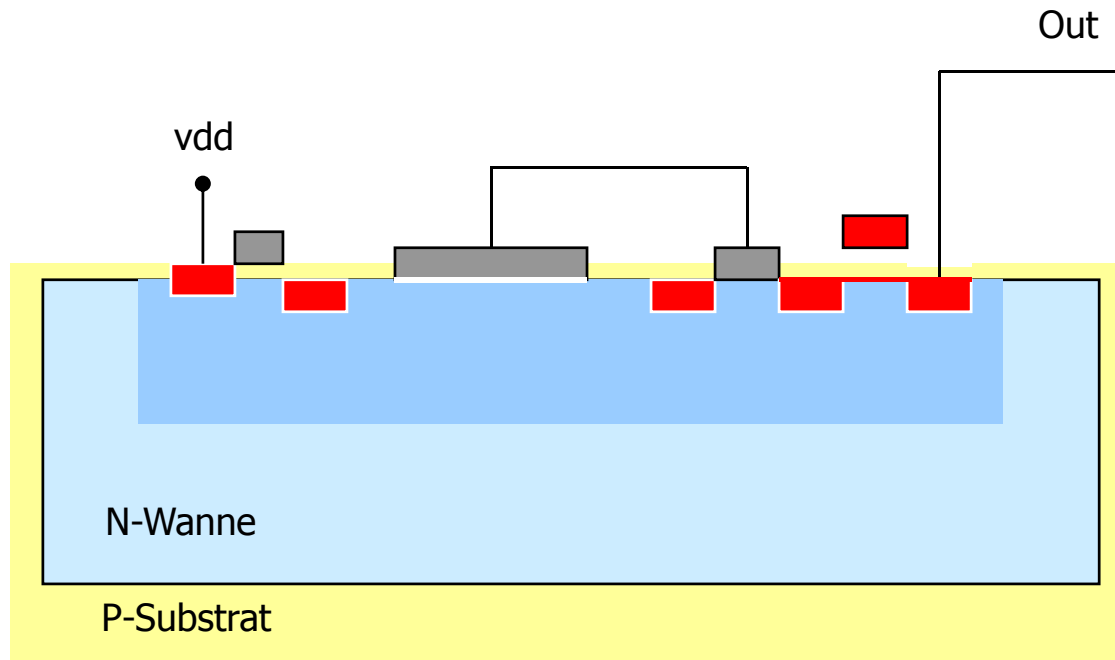
Charge collection



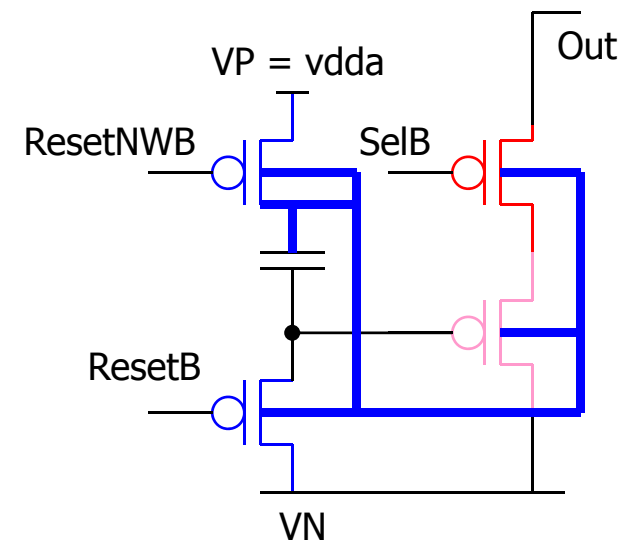
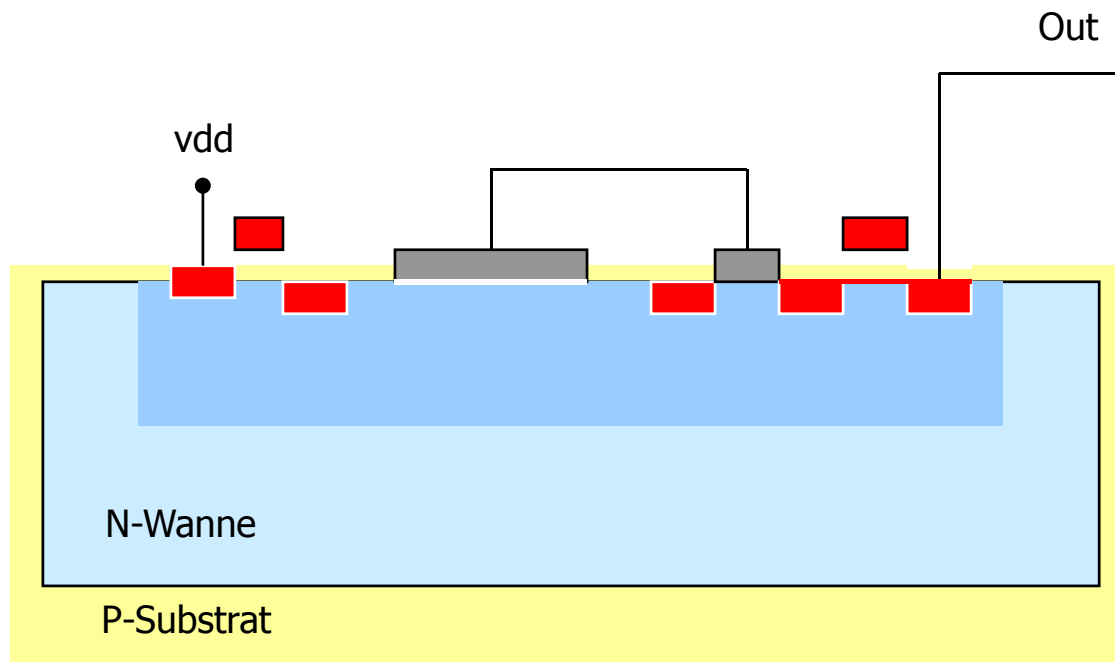
Signal readout



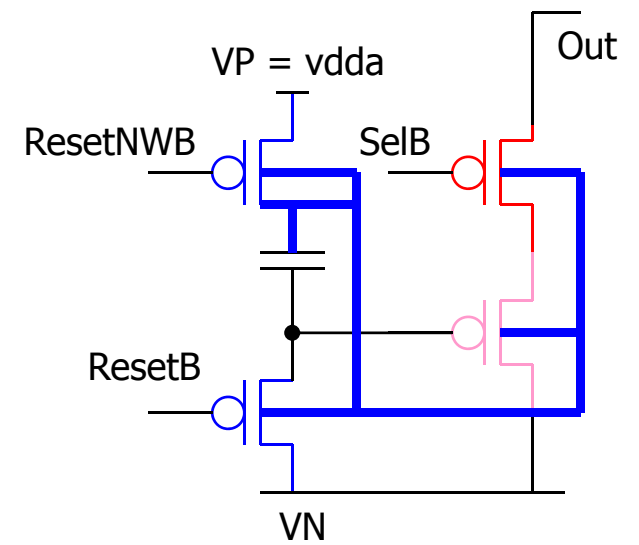
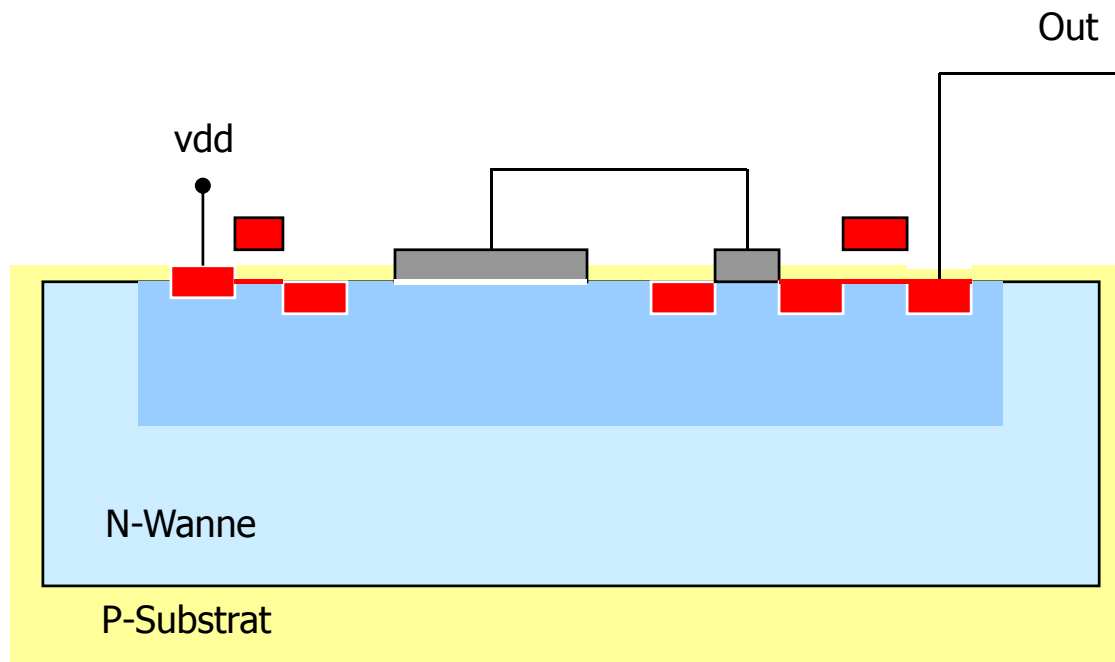
Signal readout



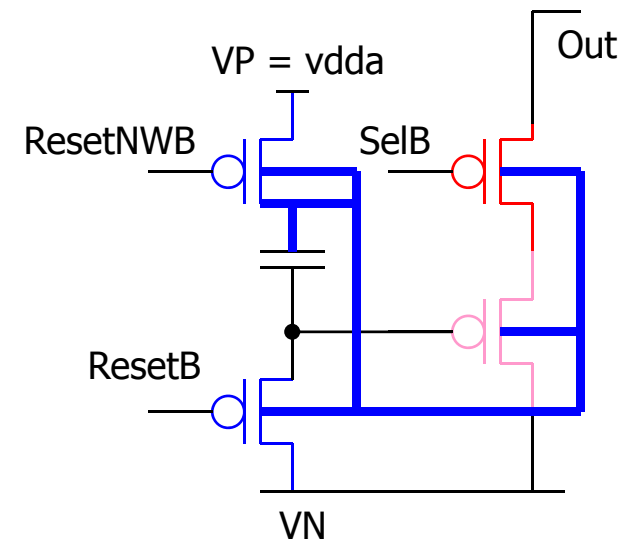
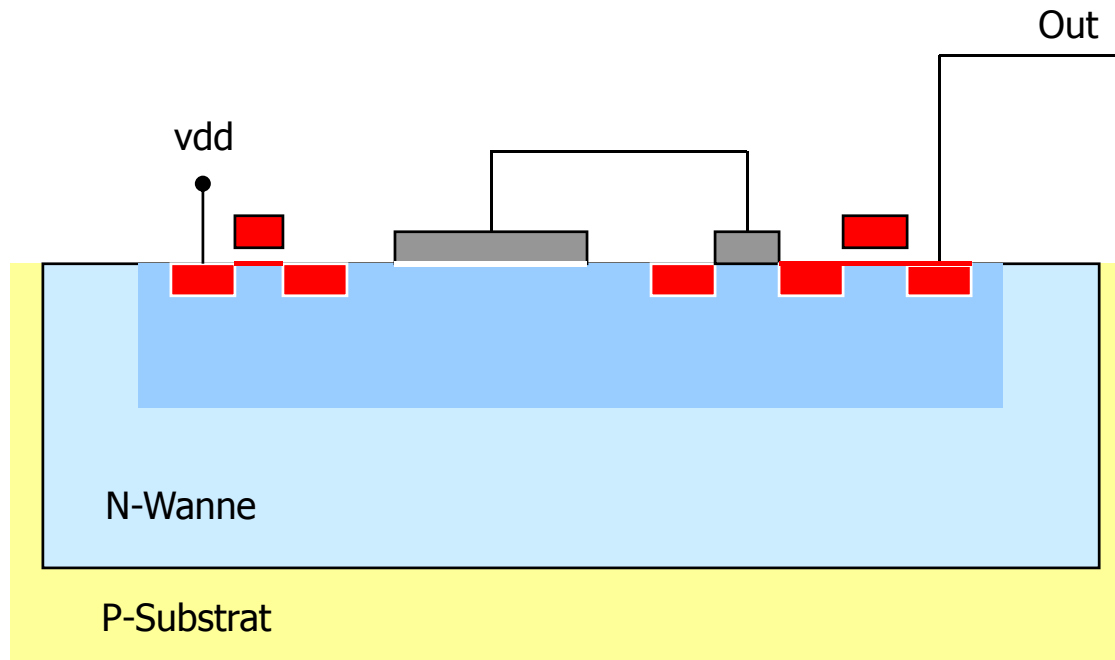
Reset



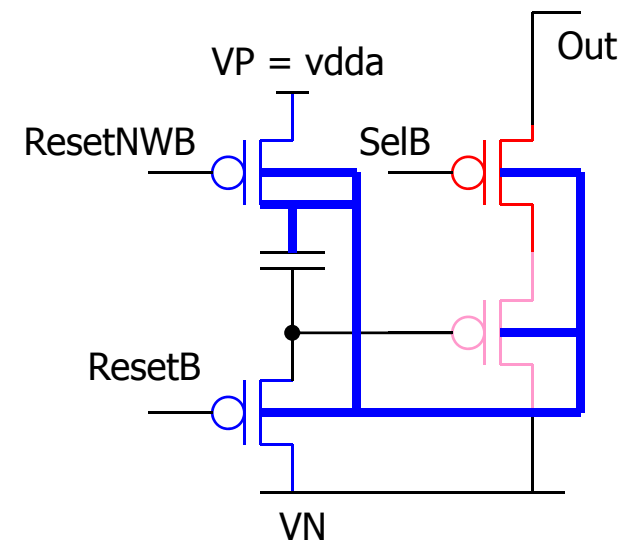
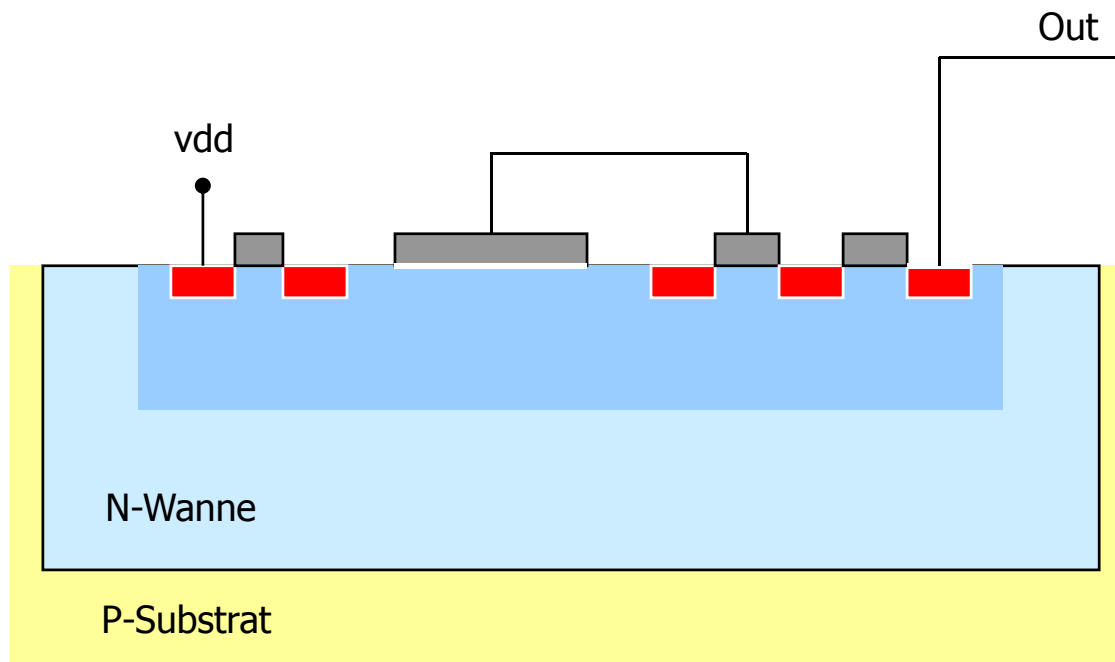
Reset



Reset + offset readout

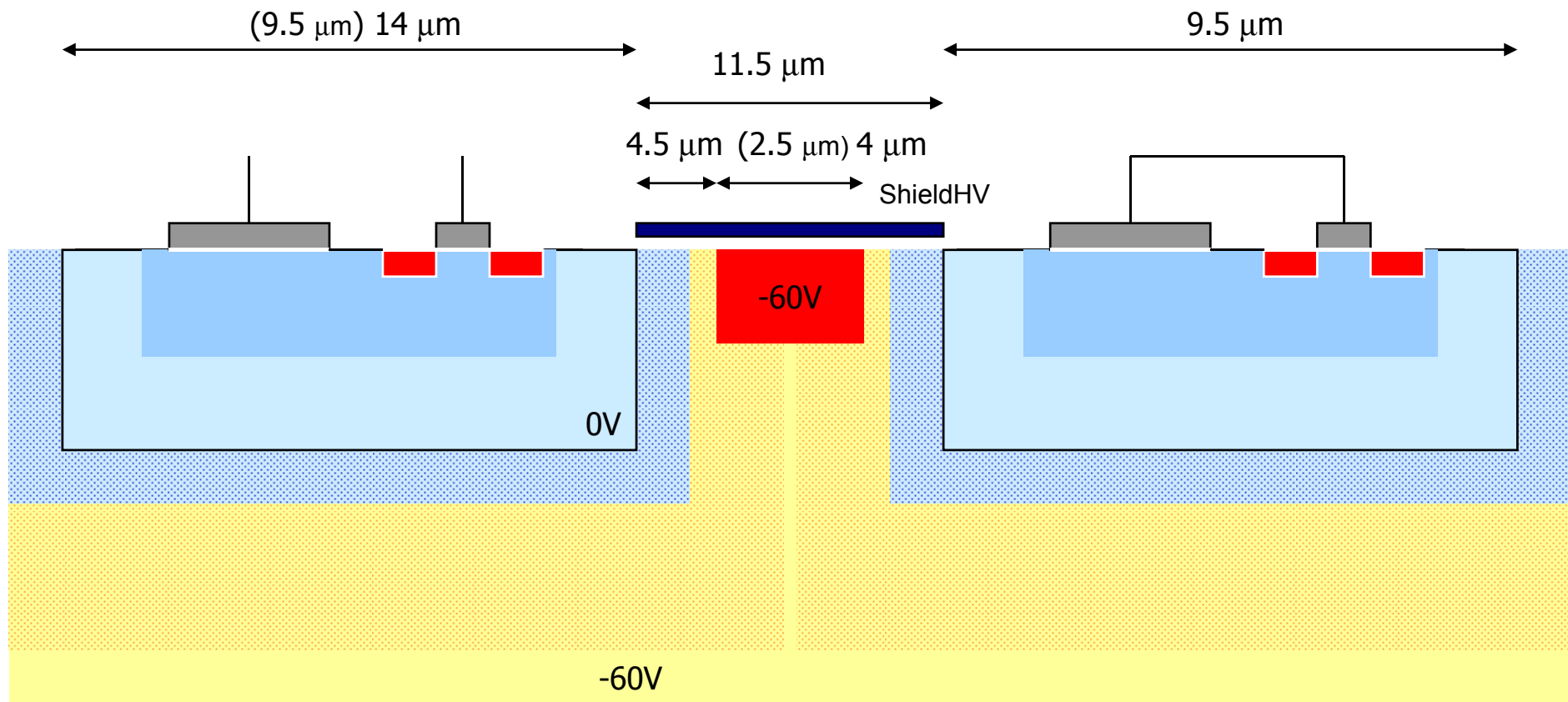


End of readout

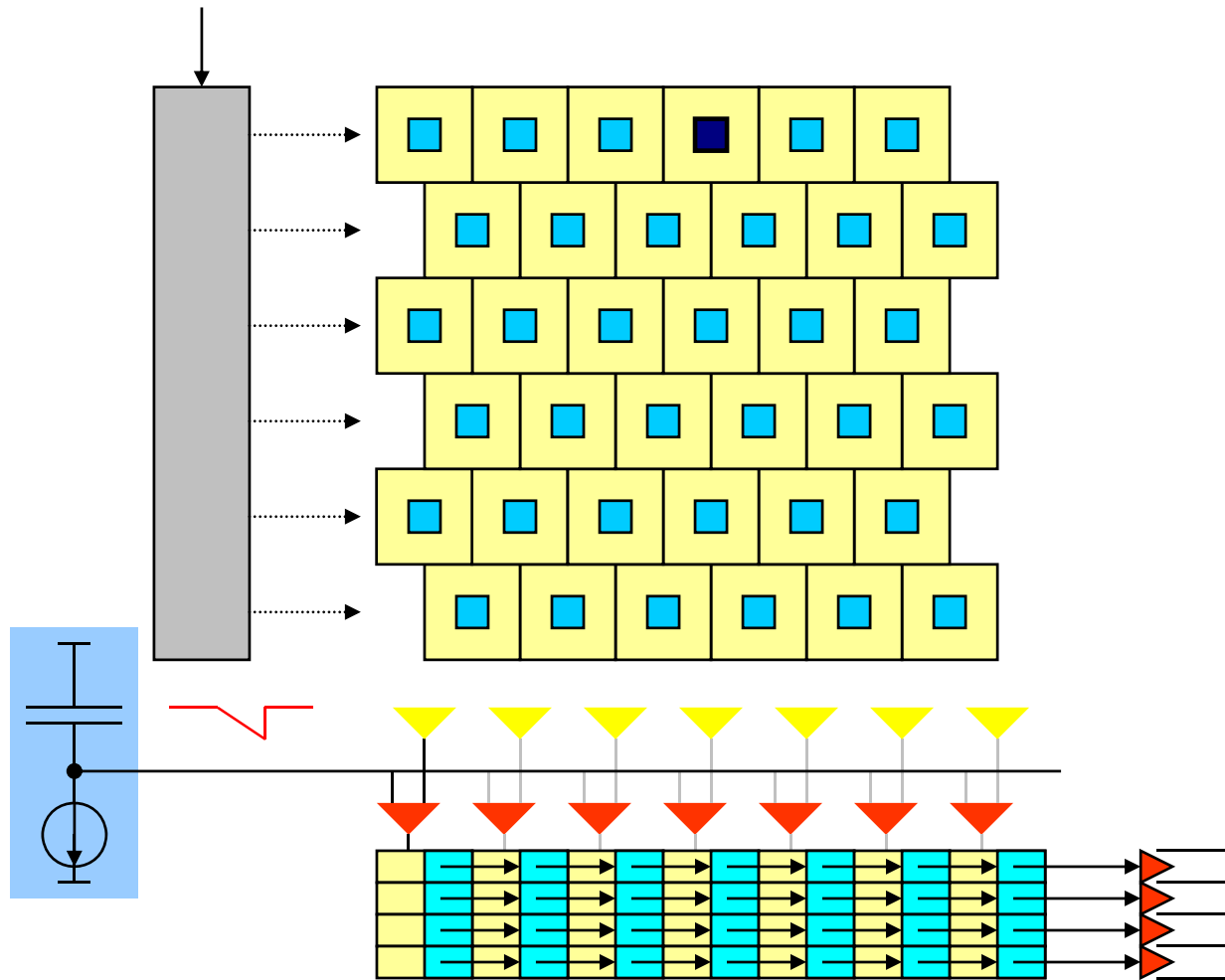


Geometry & design rules

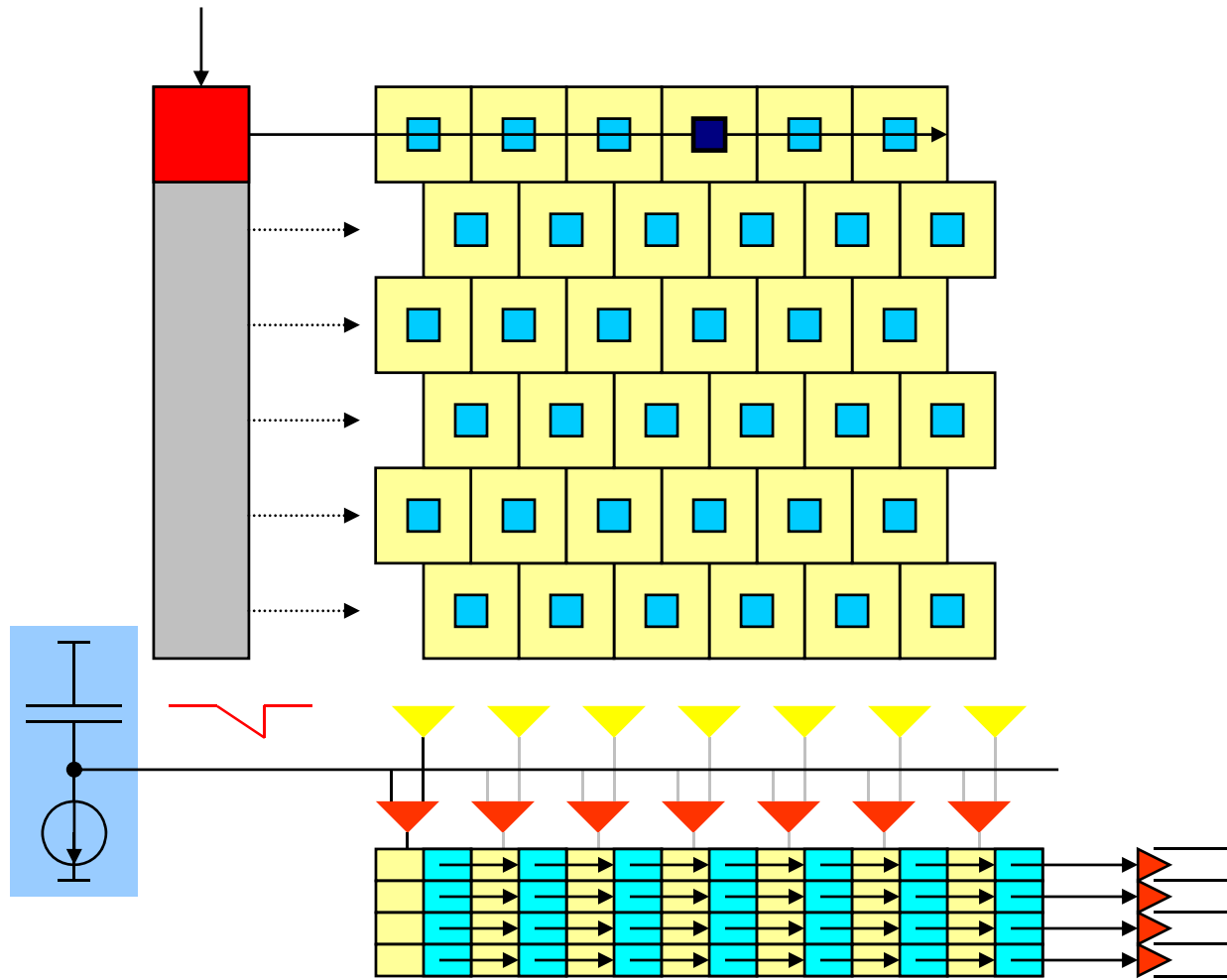
Pixel size: 21 μm (27.5 μm)



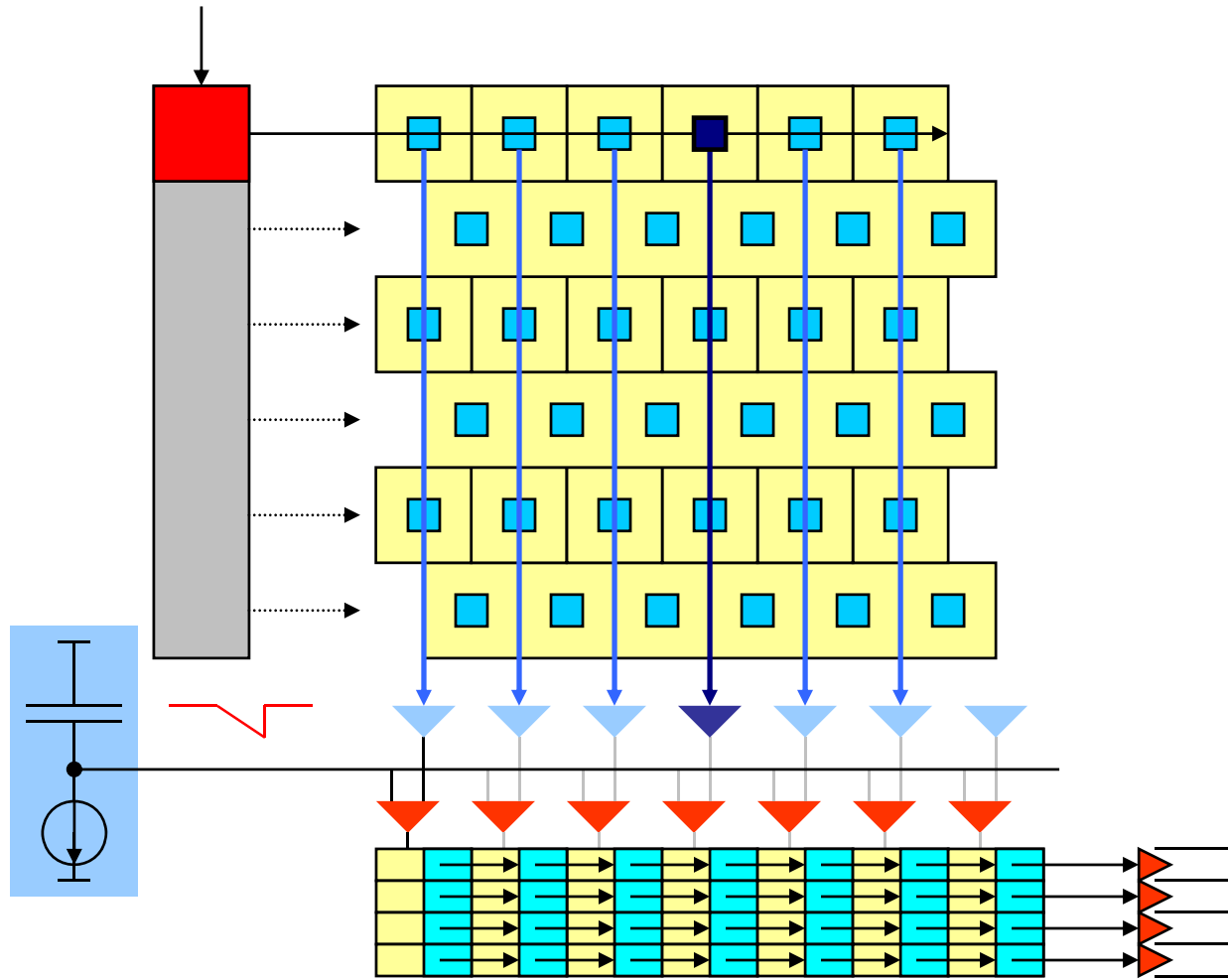
A/D conversion and readout - Start



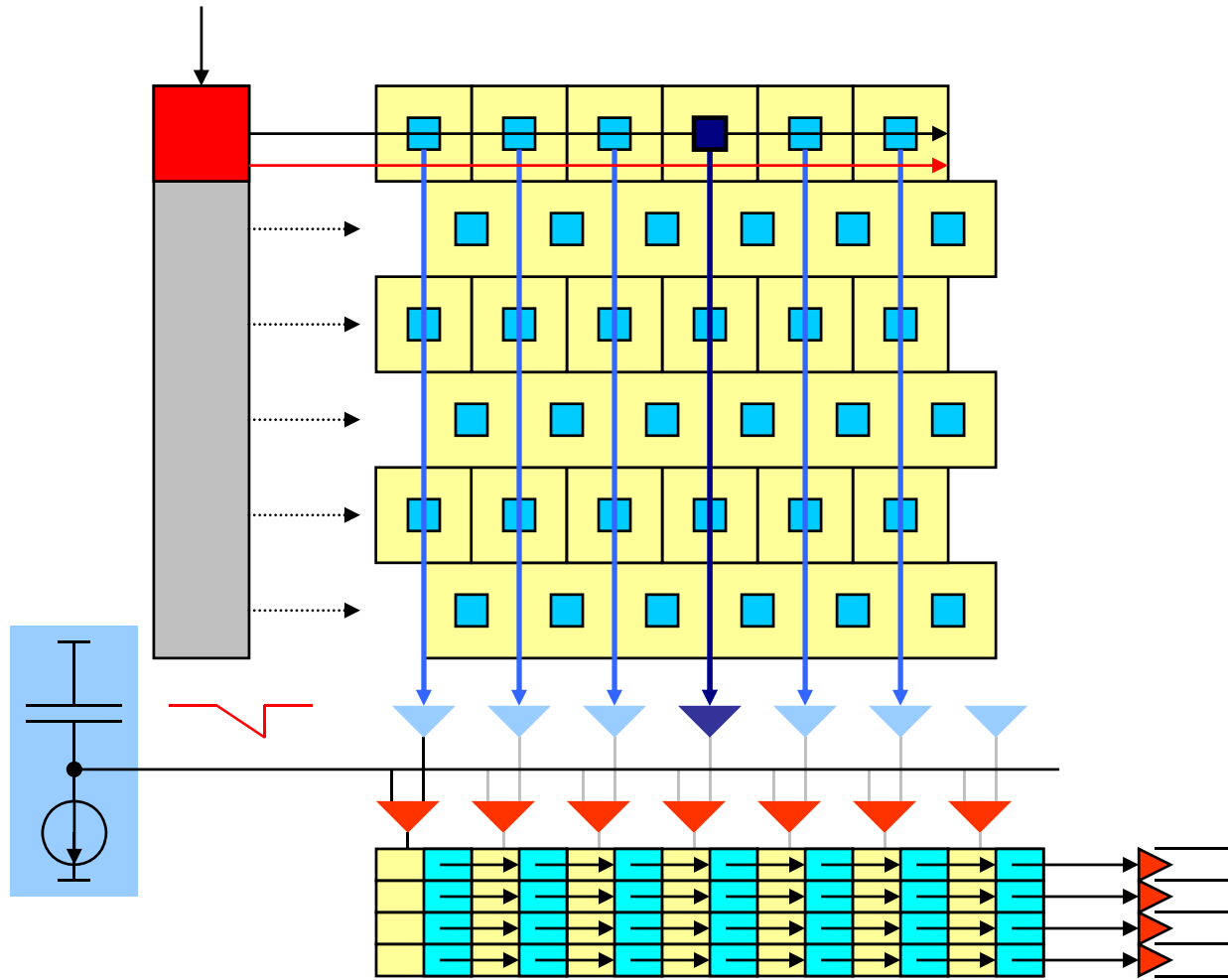
Select row



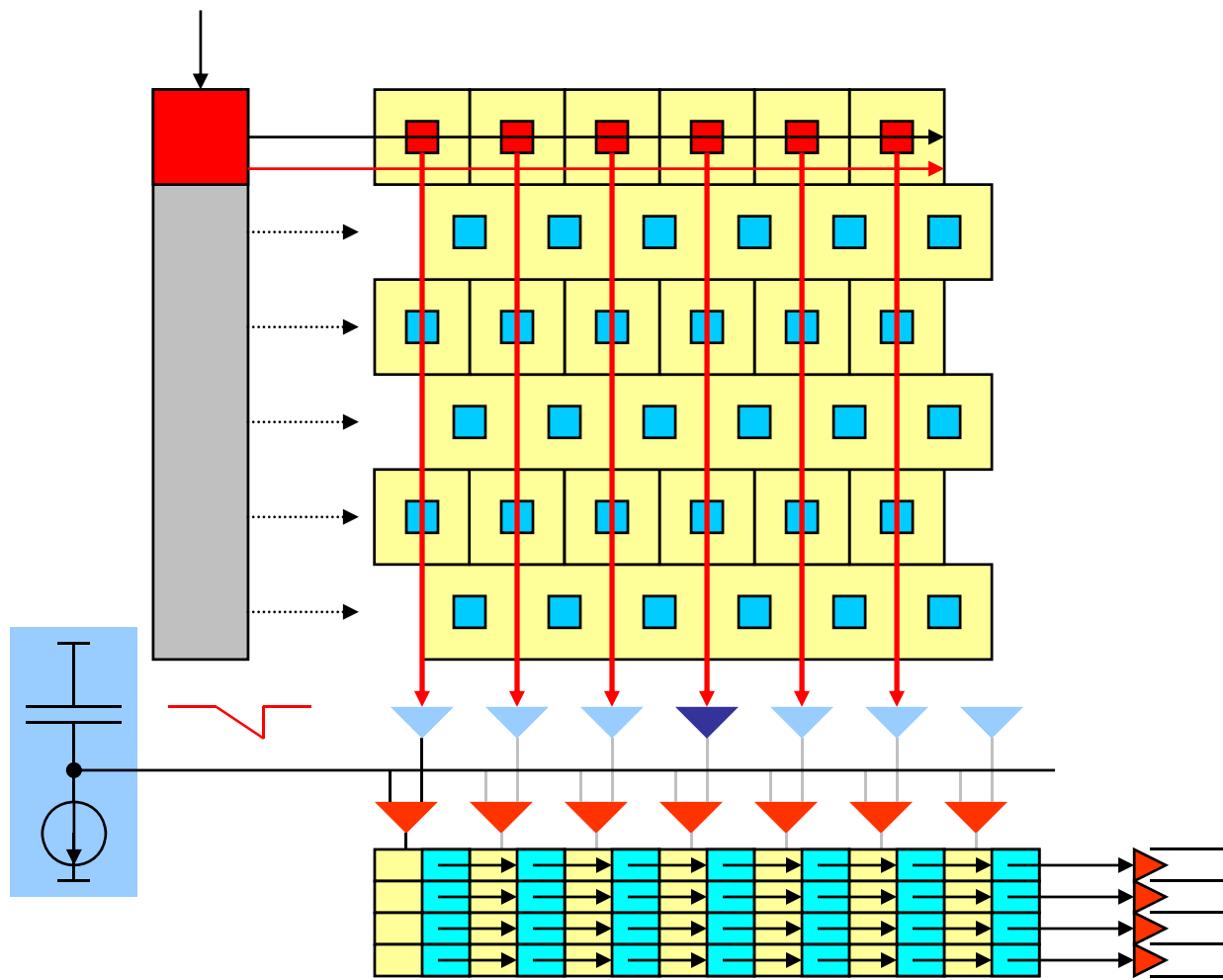
Store signal



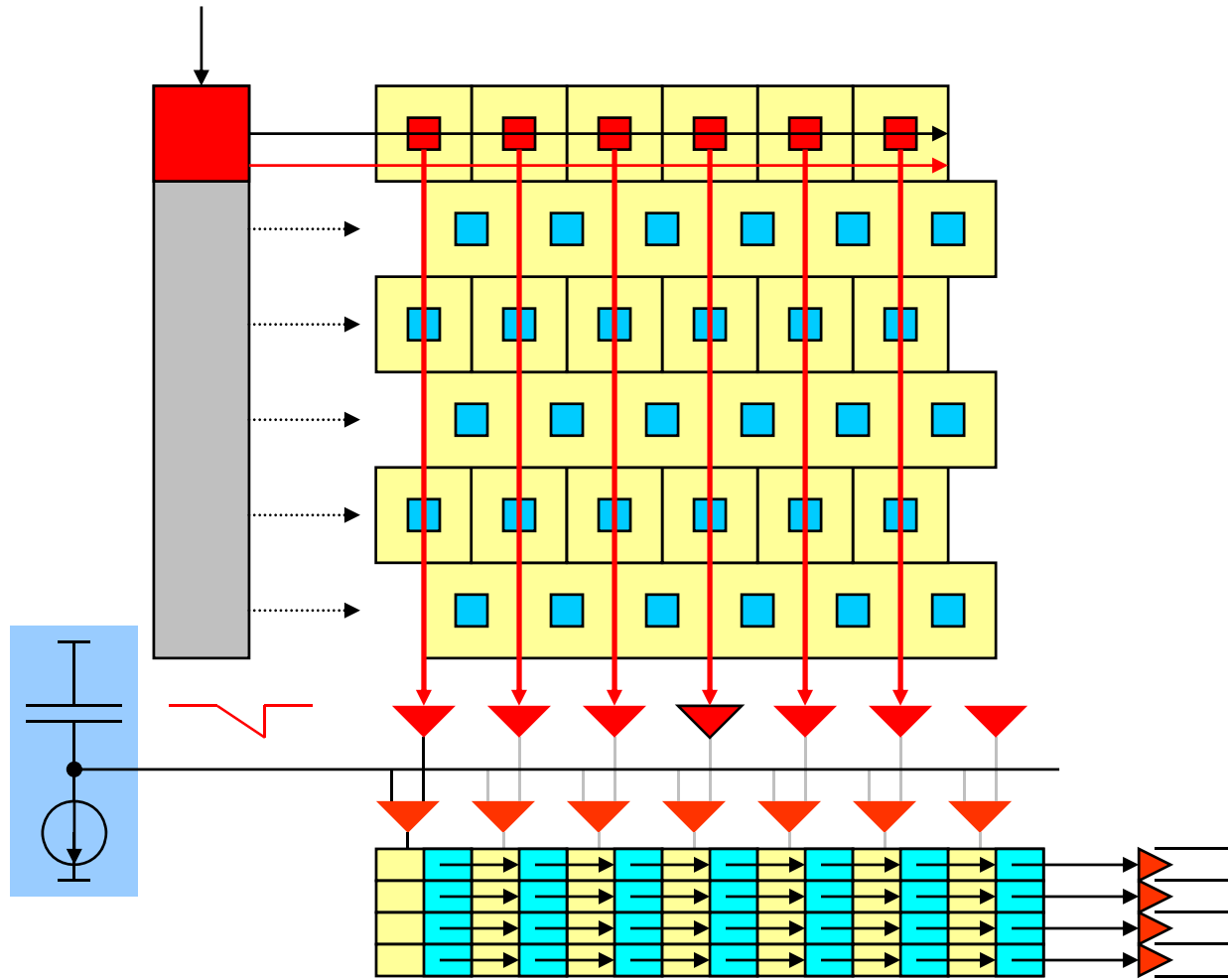
Reset



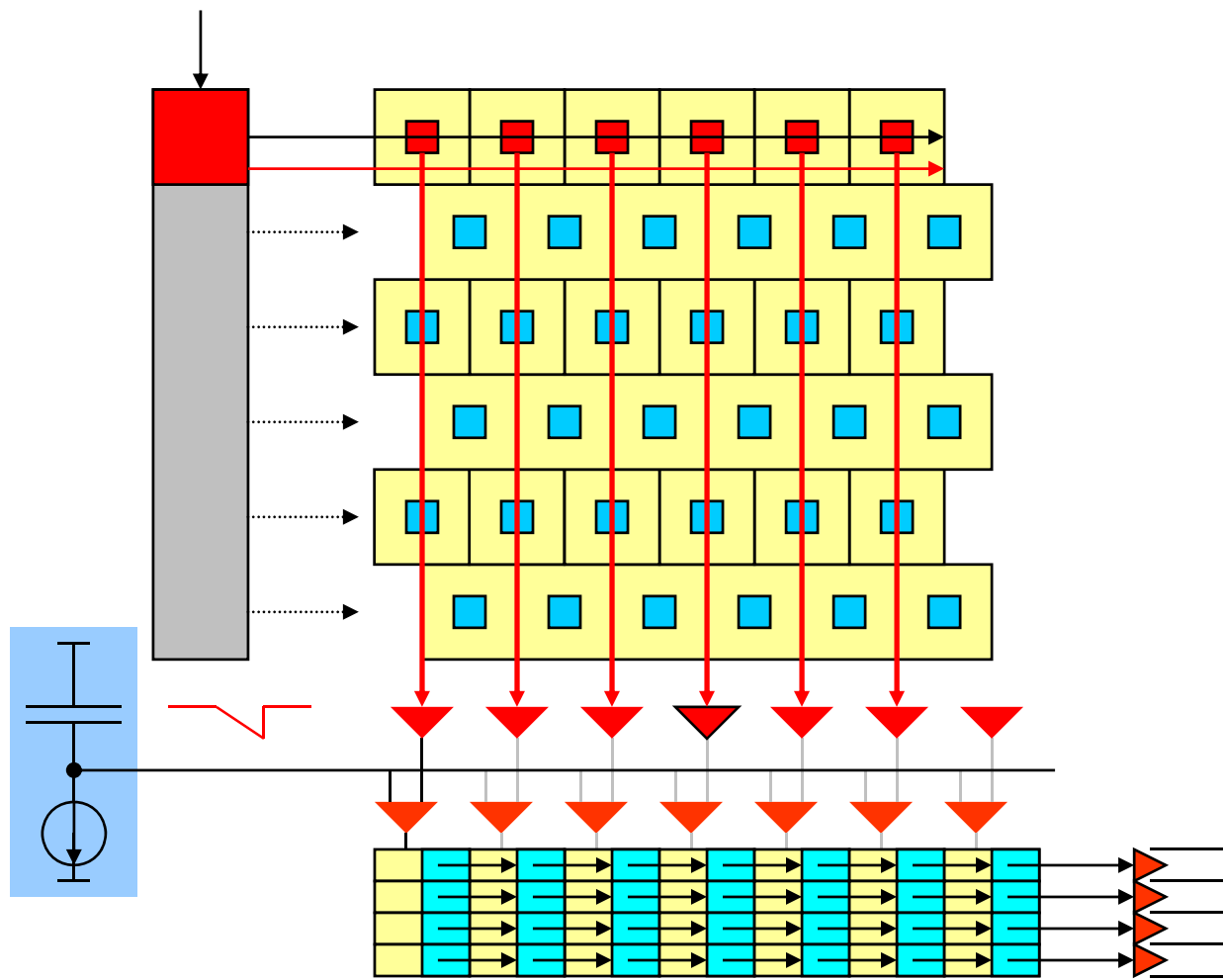
Reset



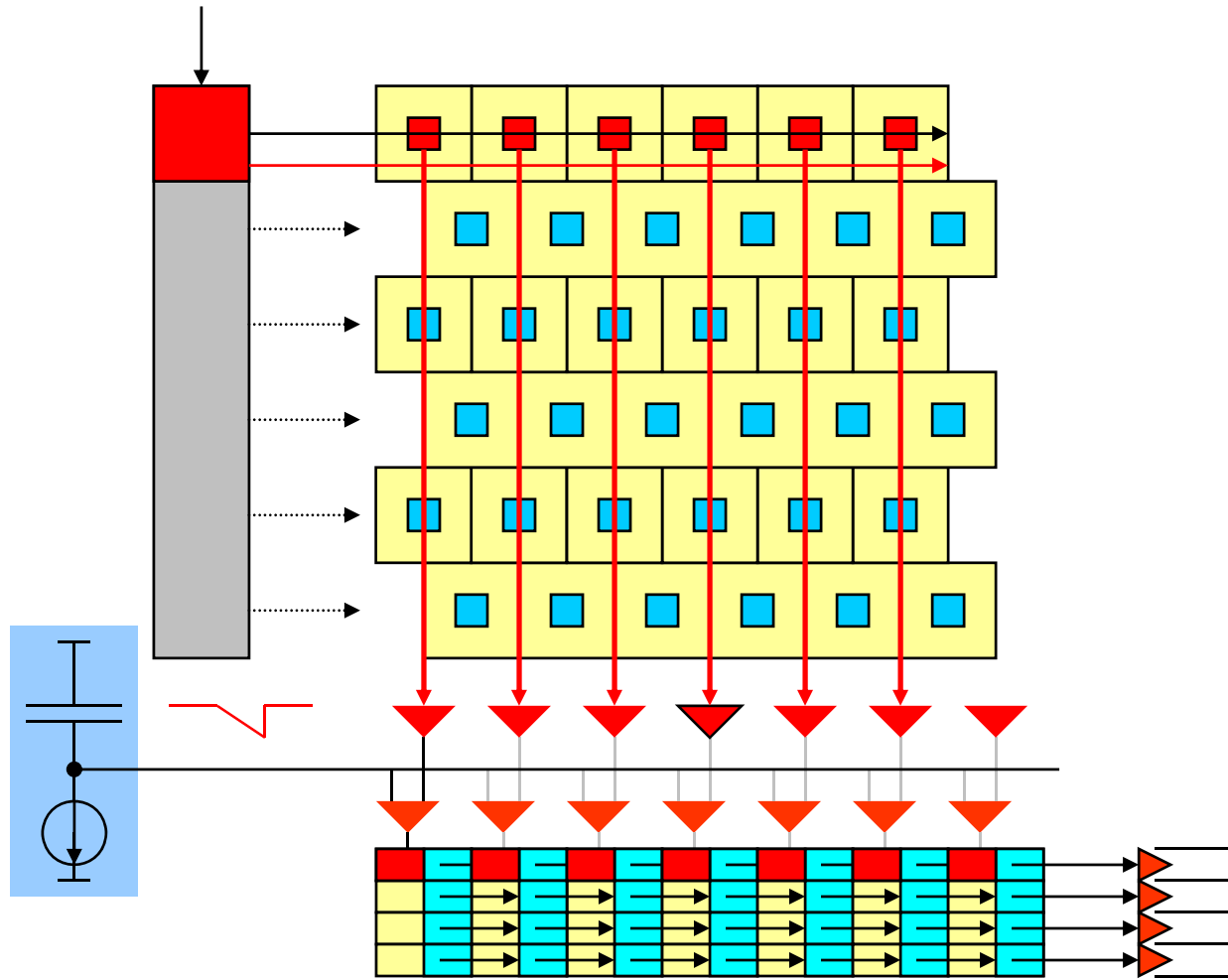
Subtract offset



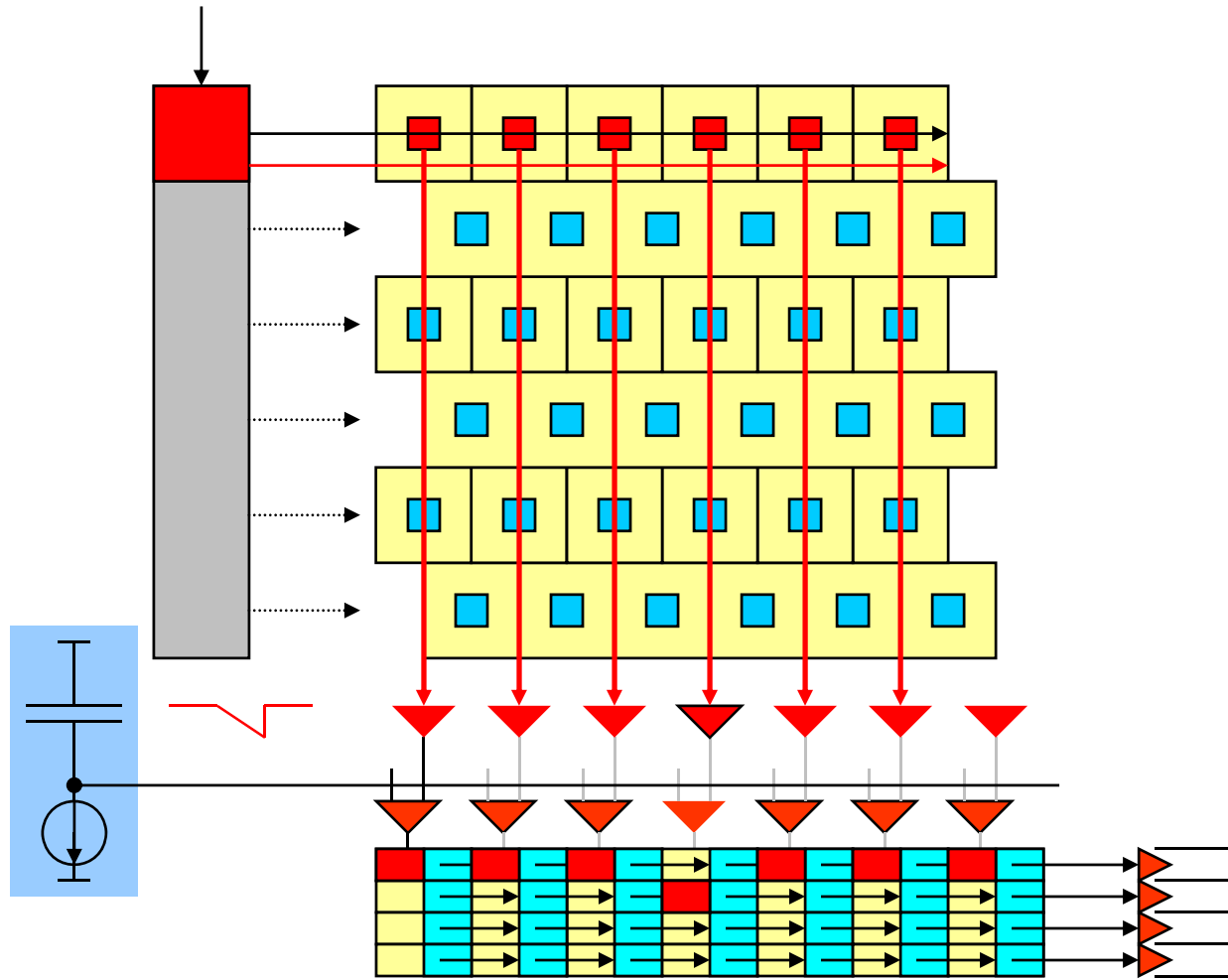
Start conversion



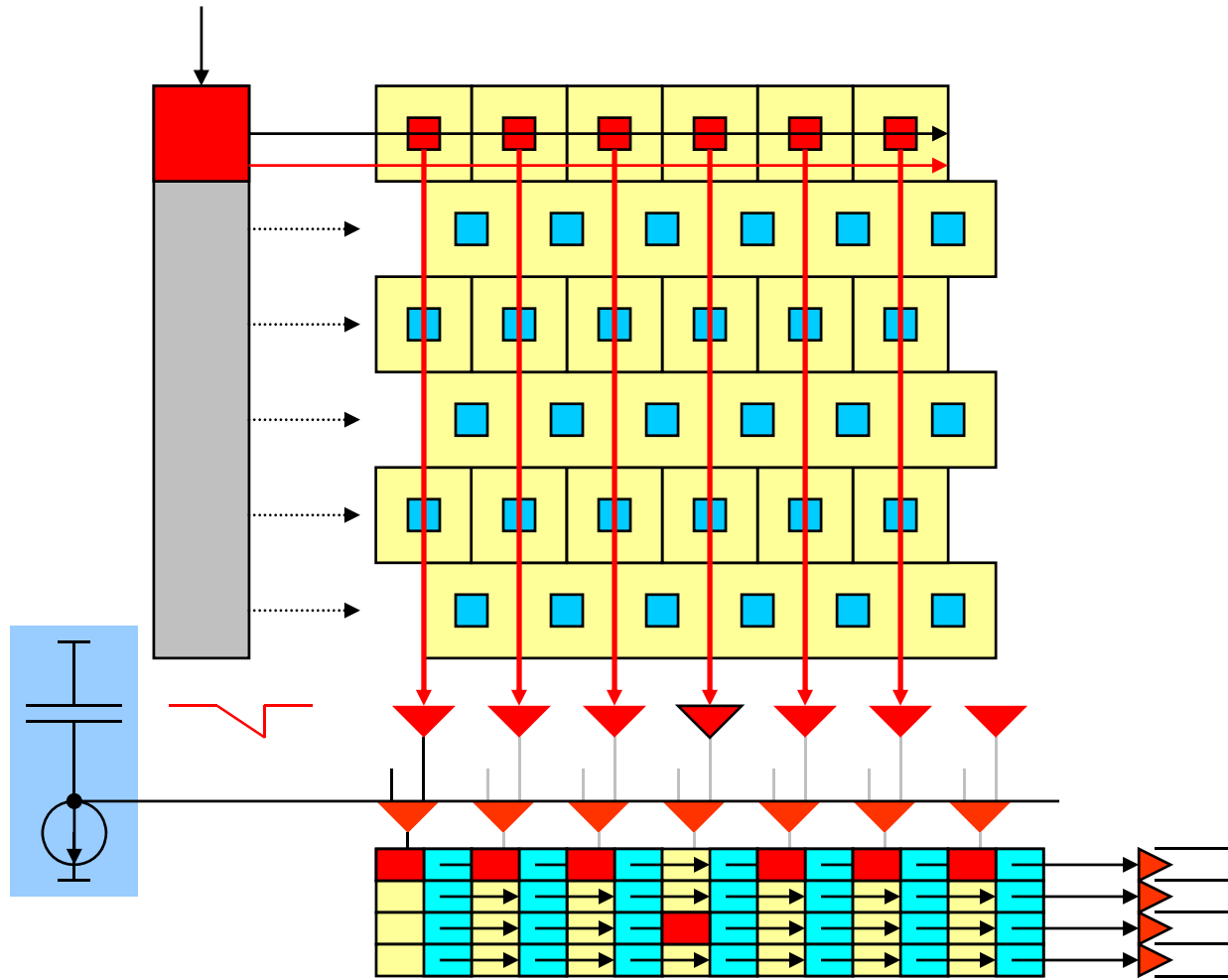
Measure Time and decrease Ramp



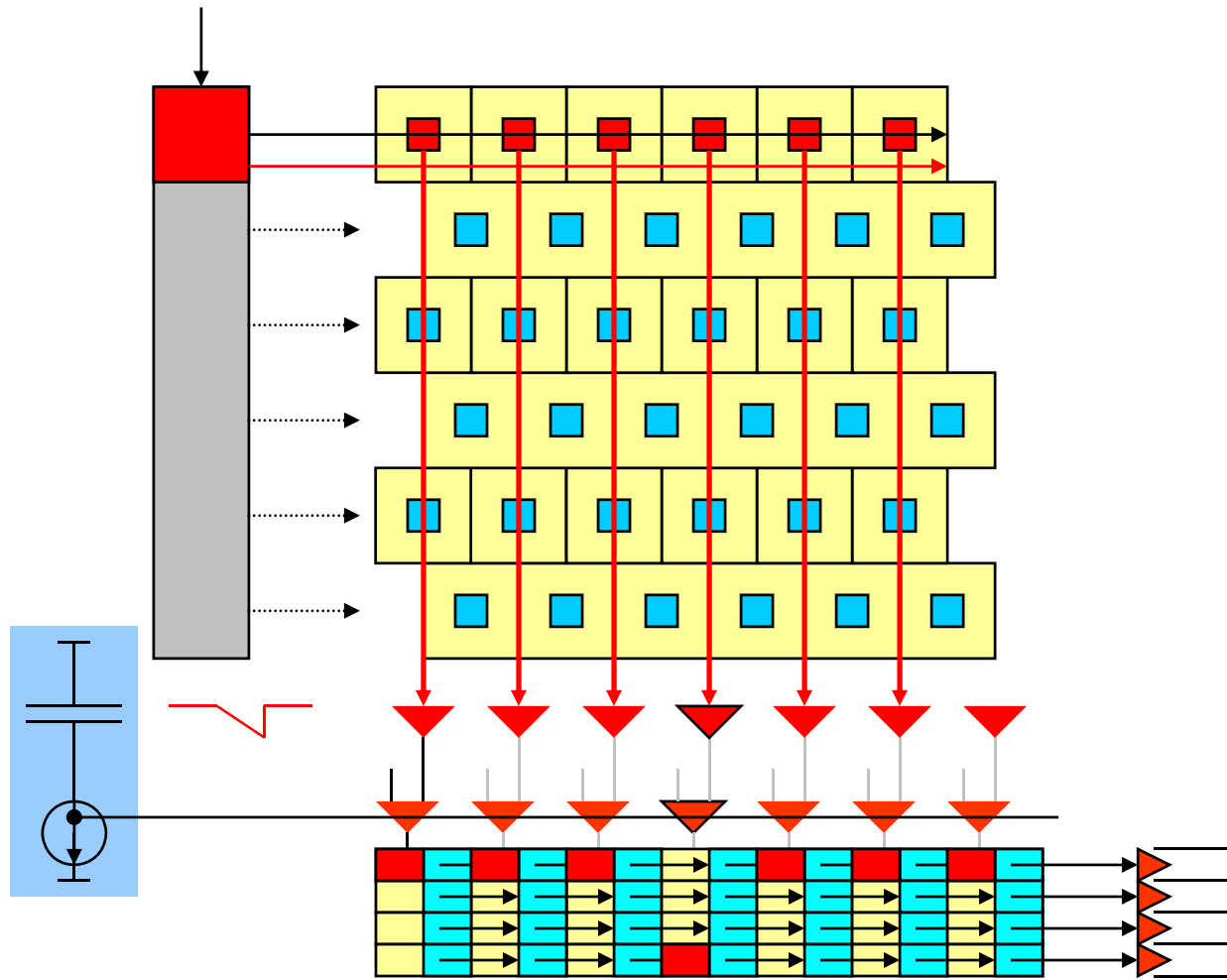
Measure Time and decrease Ramp



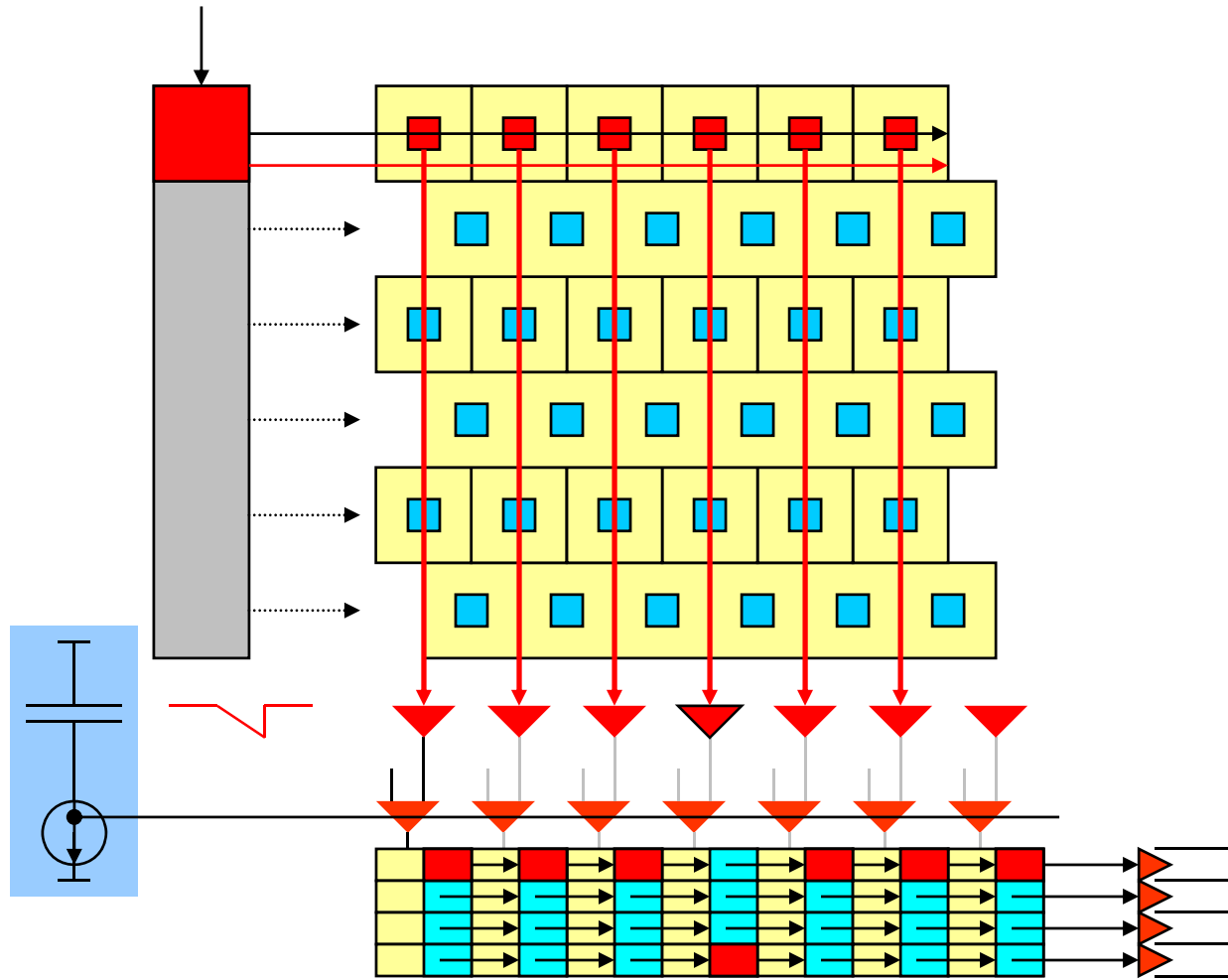
Measure Time and decrease Ramp



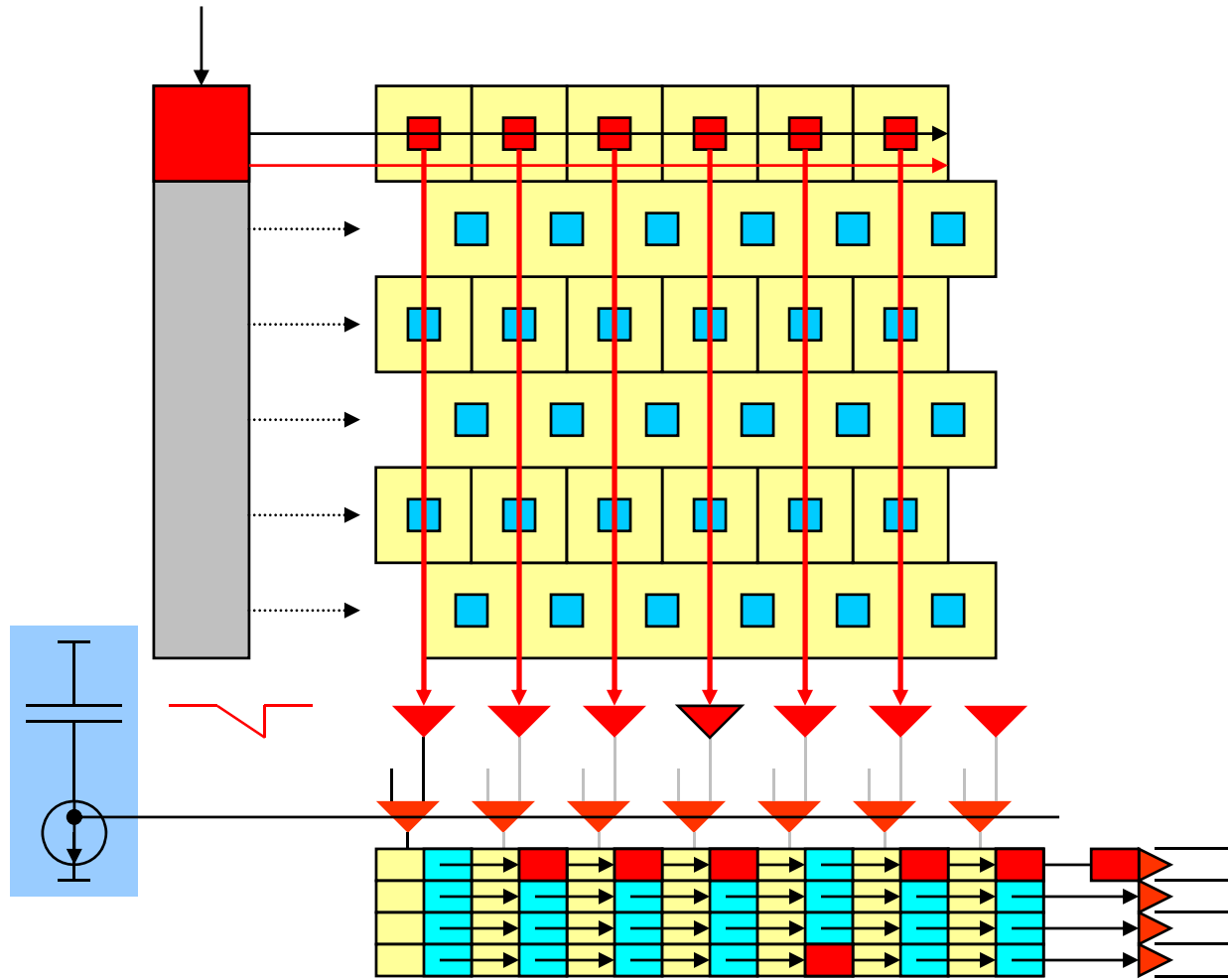
Measure Time and decrease Ramp



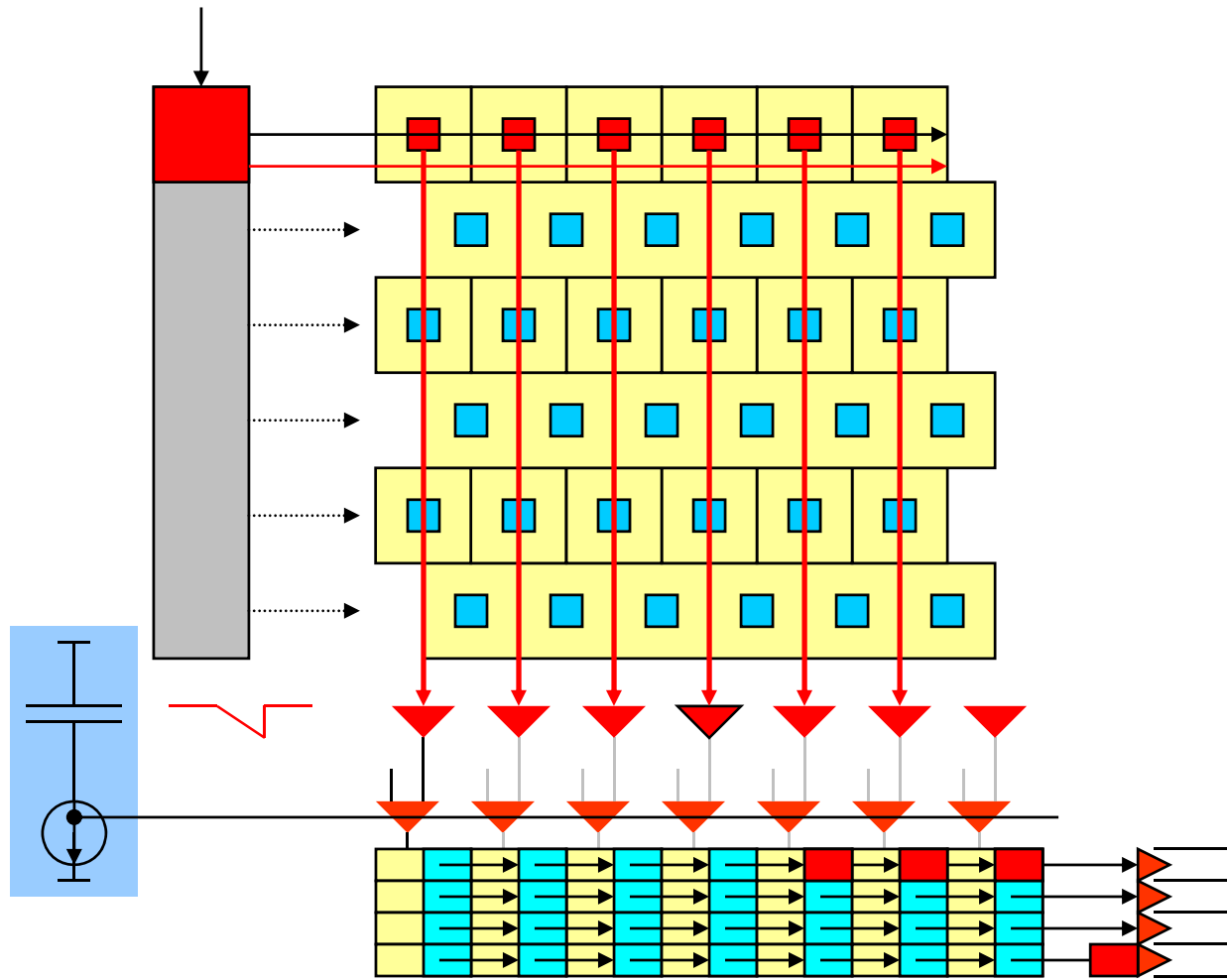
Shift out of time stamps



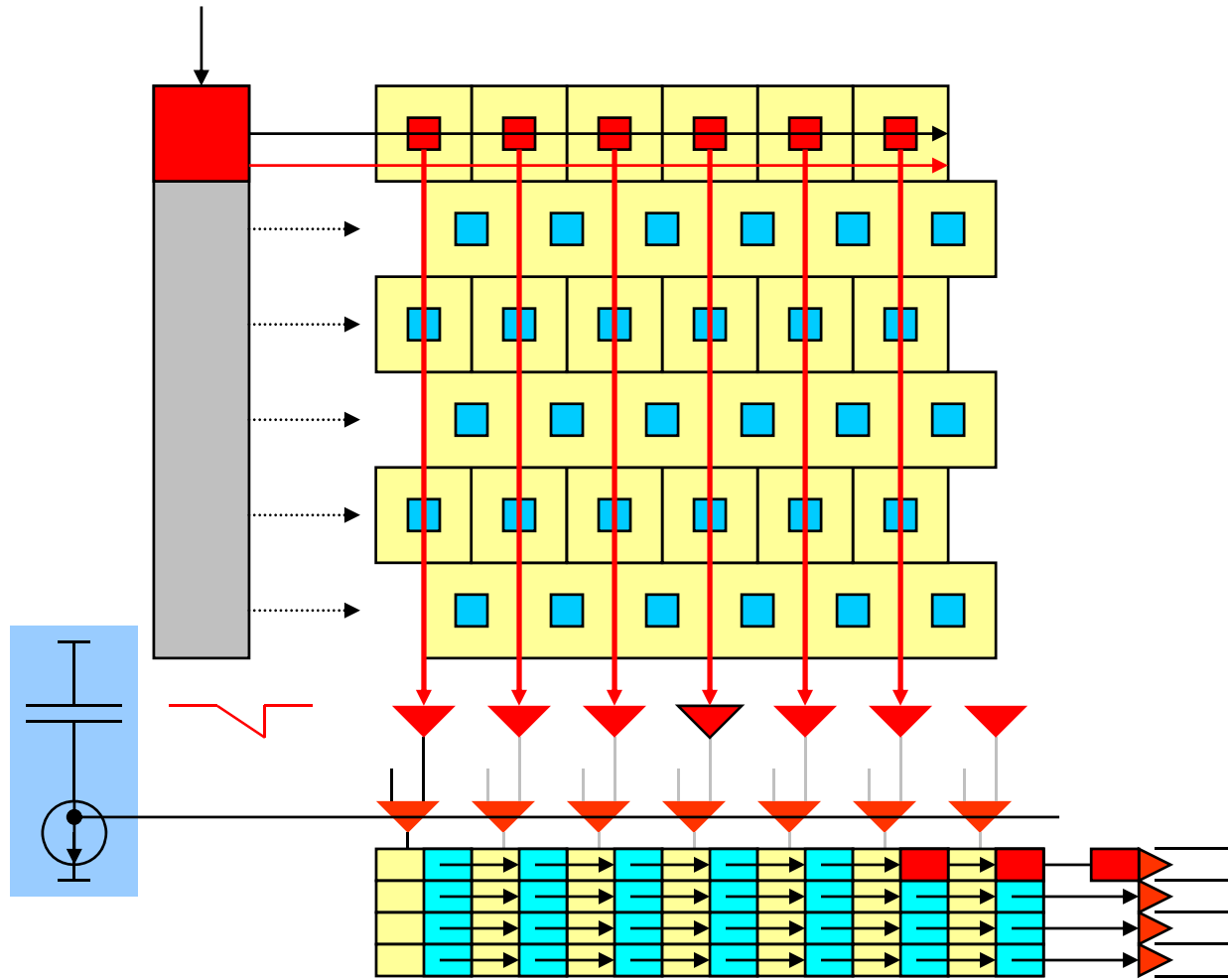
Shift out of time stamps



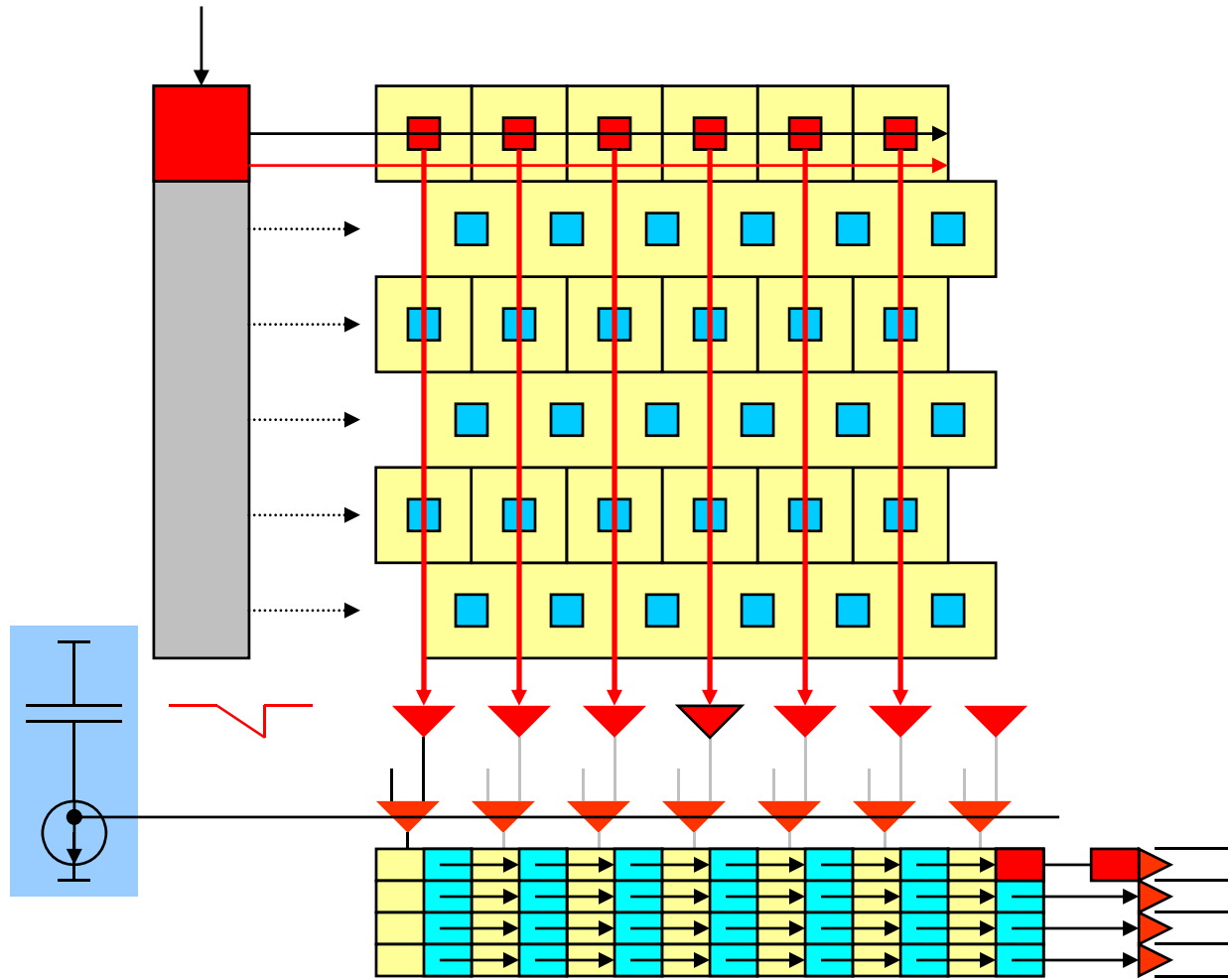
Shift out of time stamps



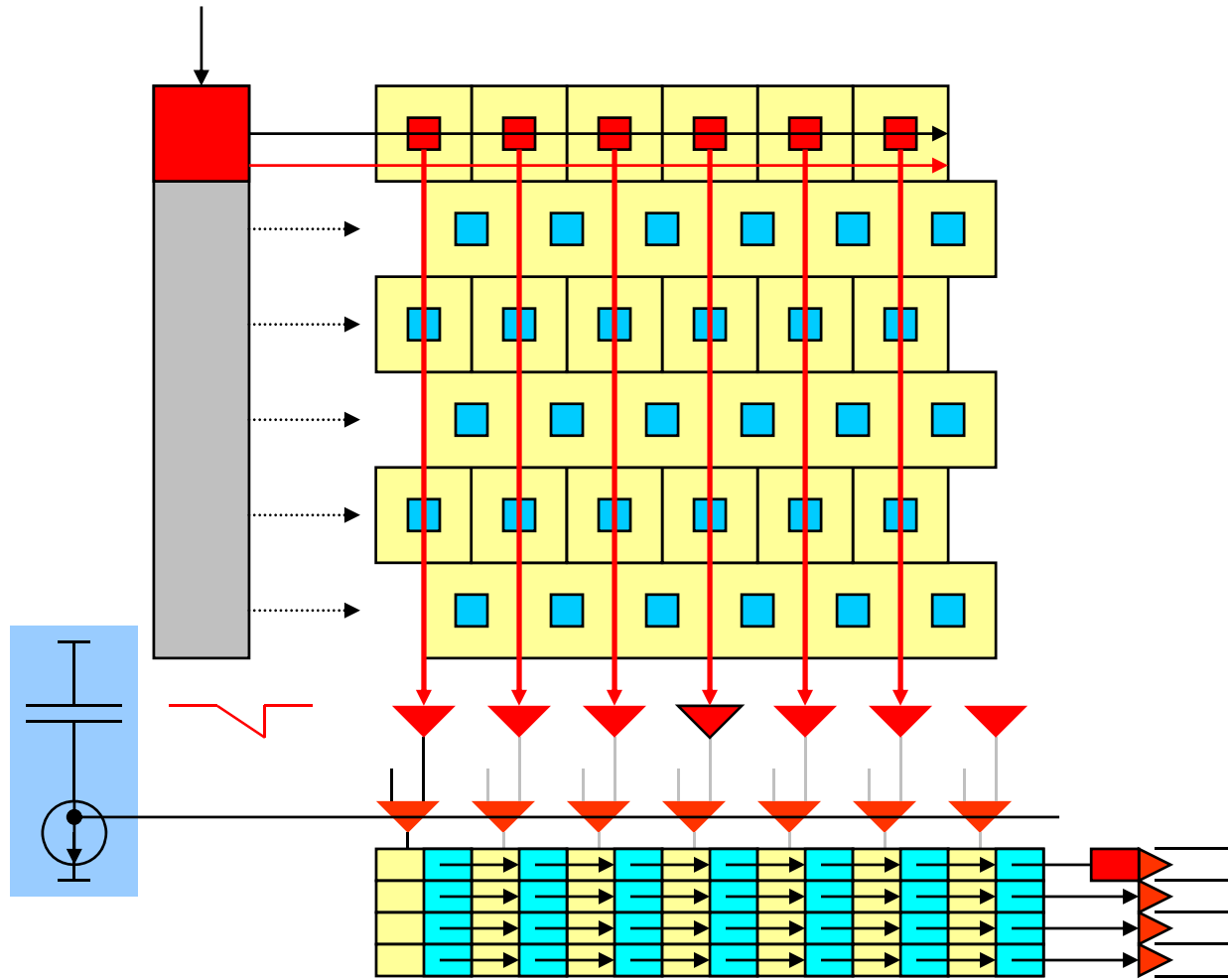
Shift out of time stamps



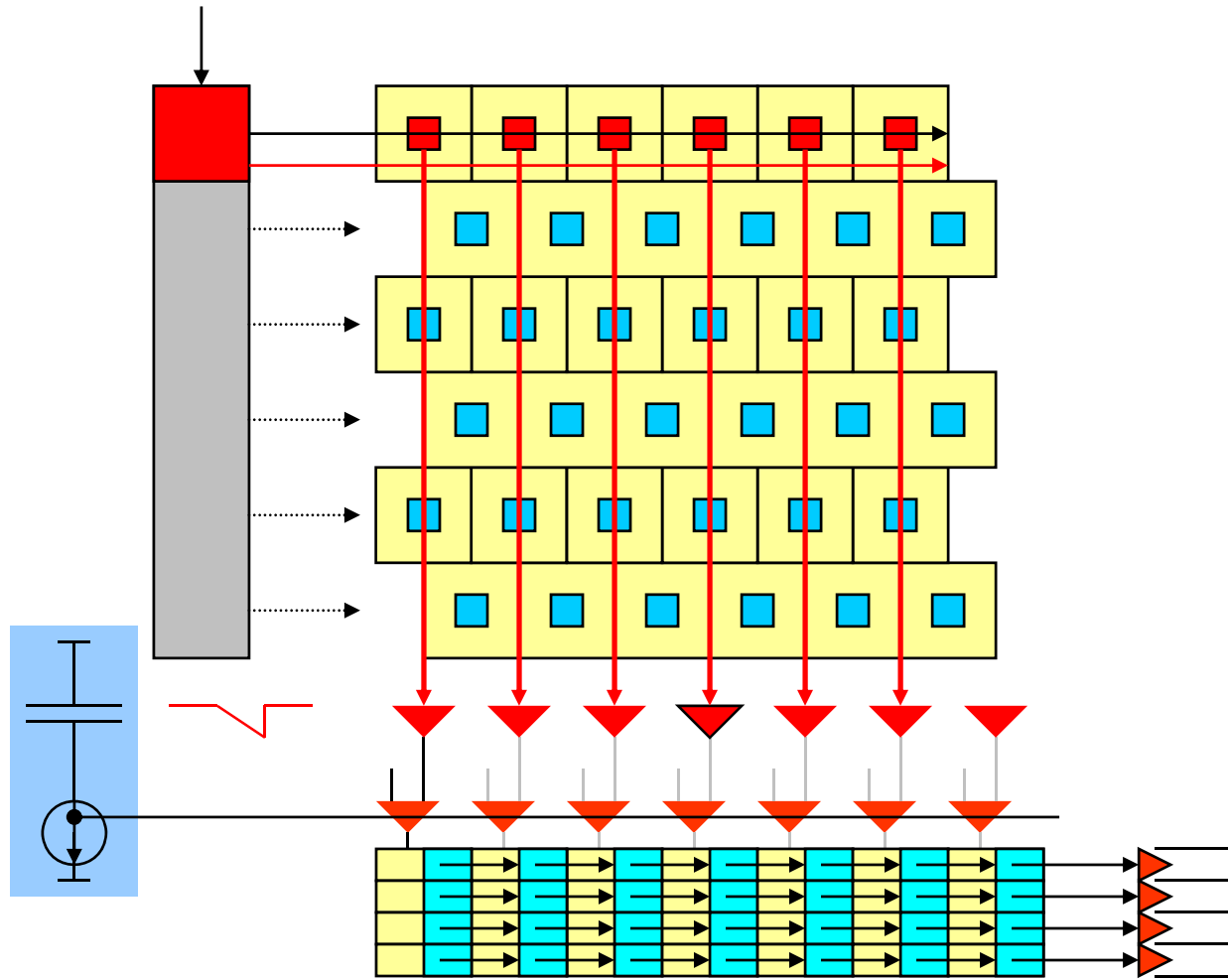
Shift out of time stamps



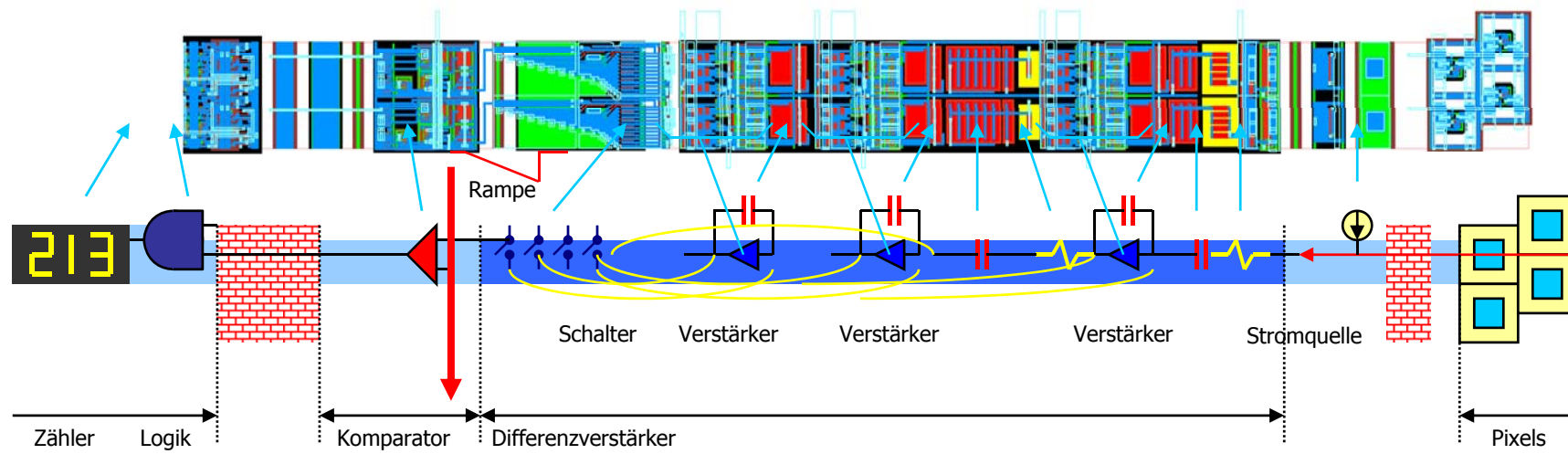
Shift out of time stamps



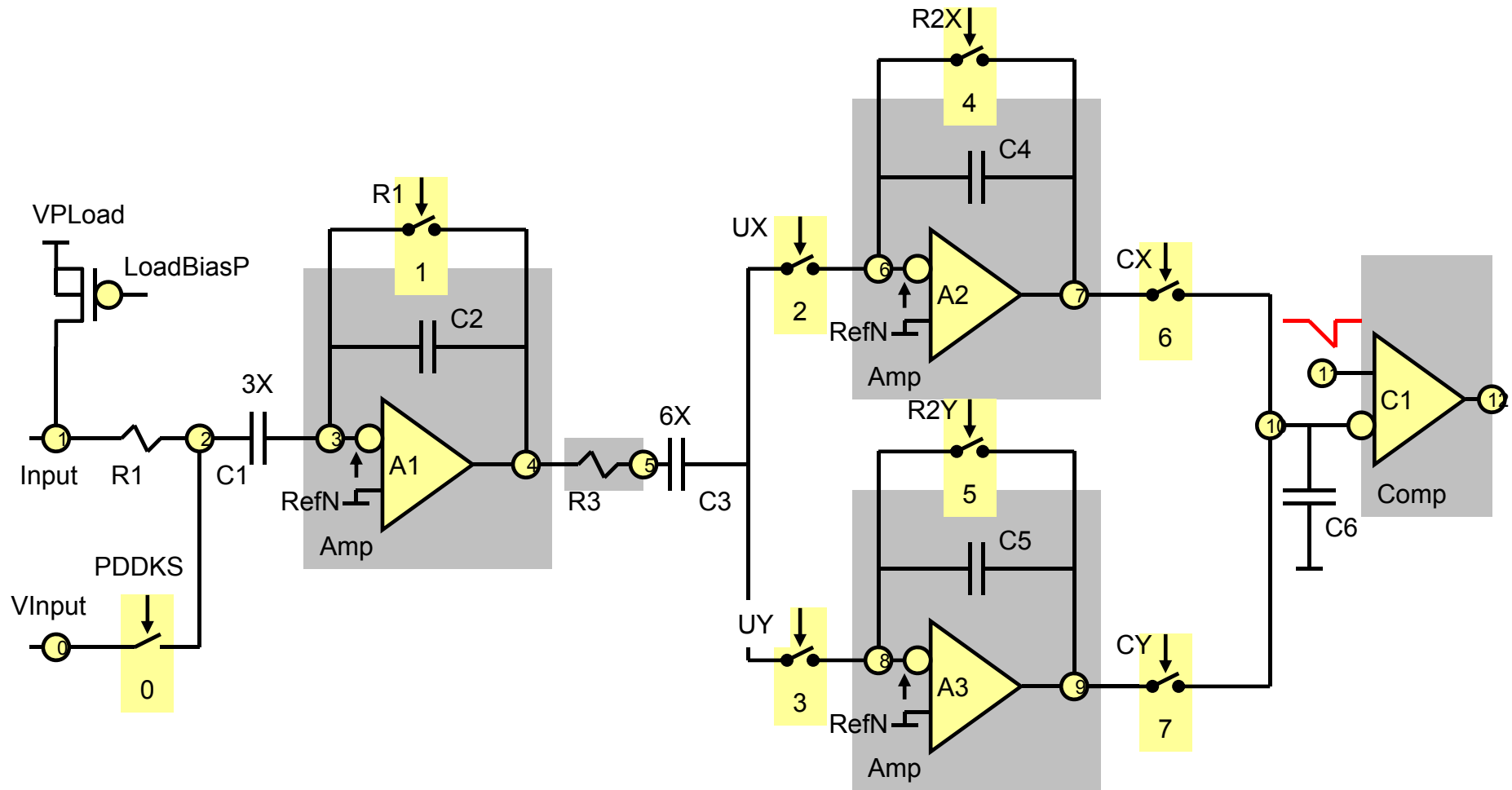
Shift out of time stamps



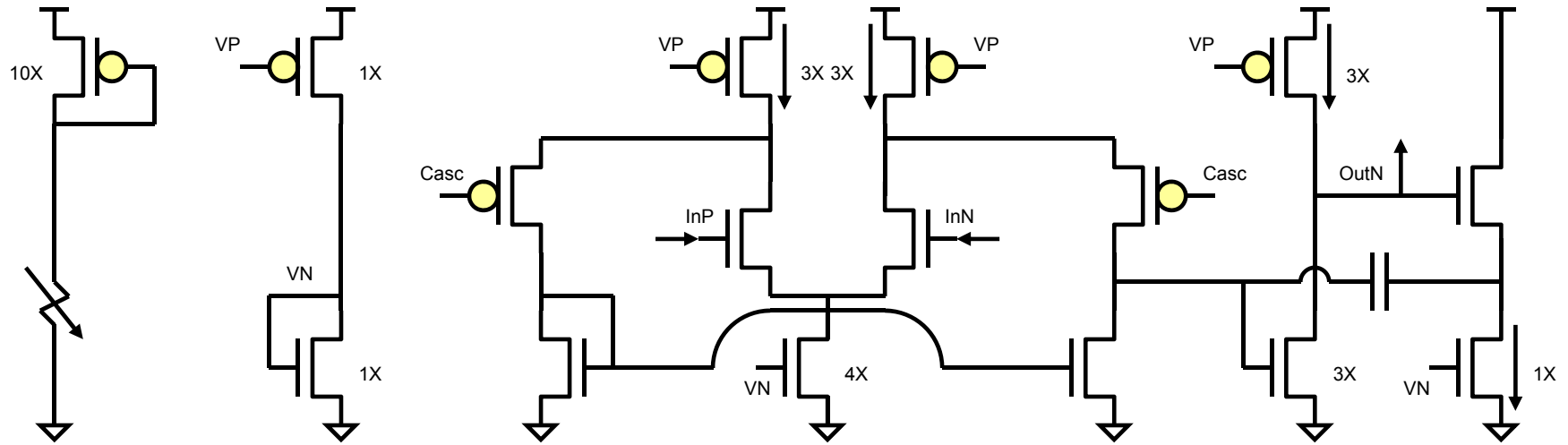
ADC



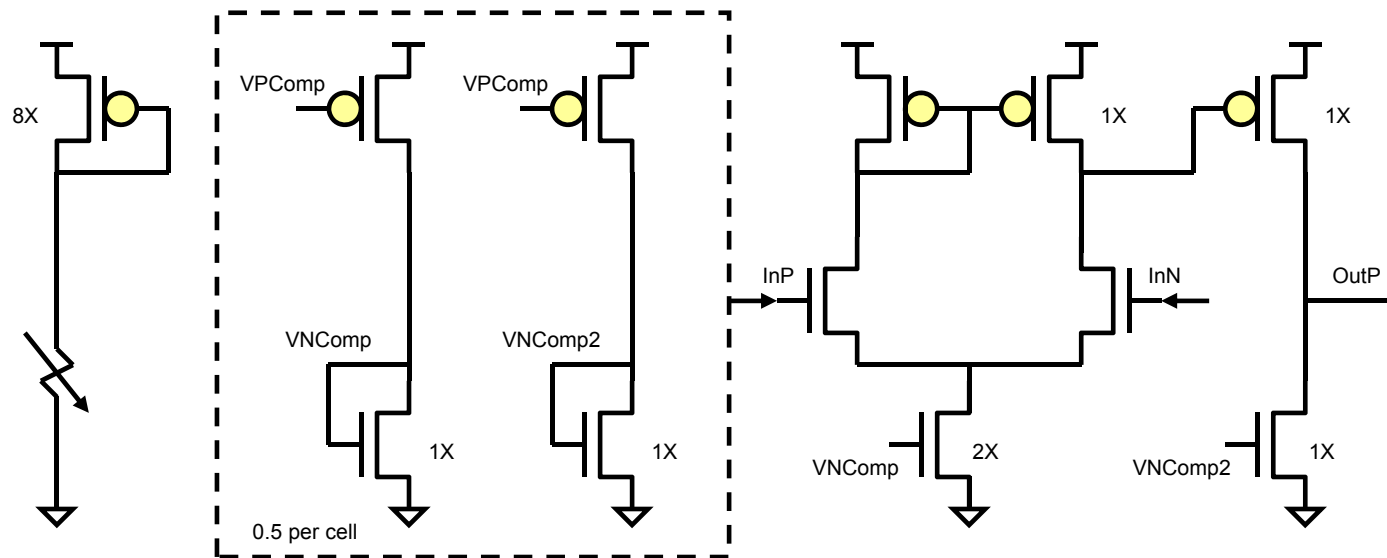
Difference amplifier



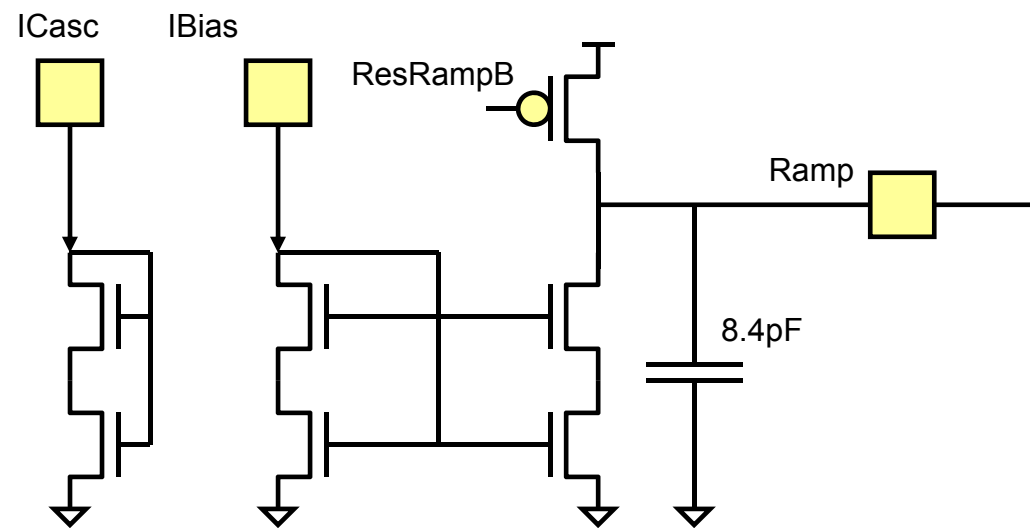
Amplifier

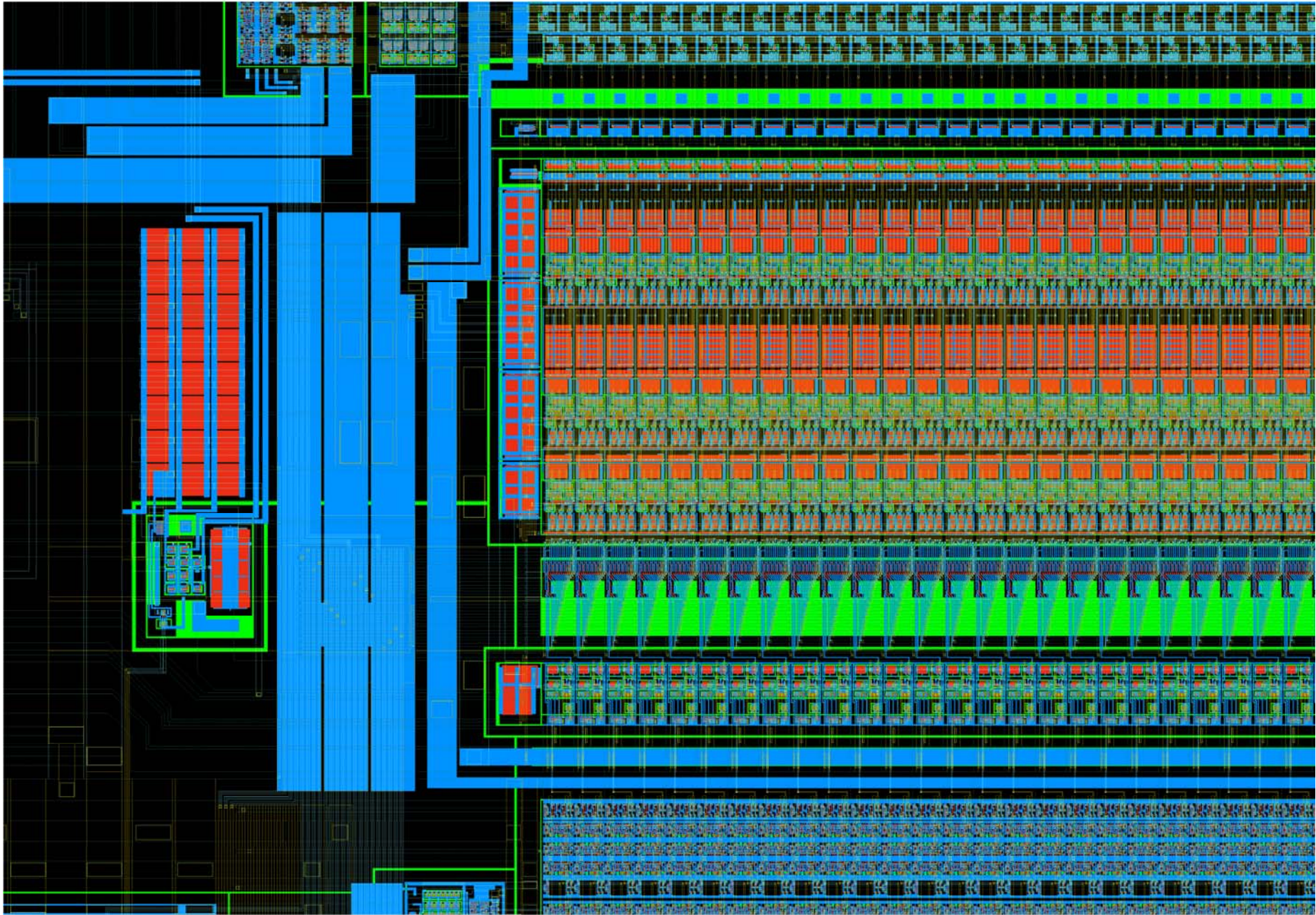


Comparator

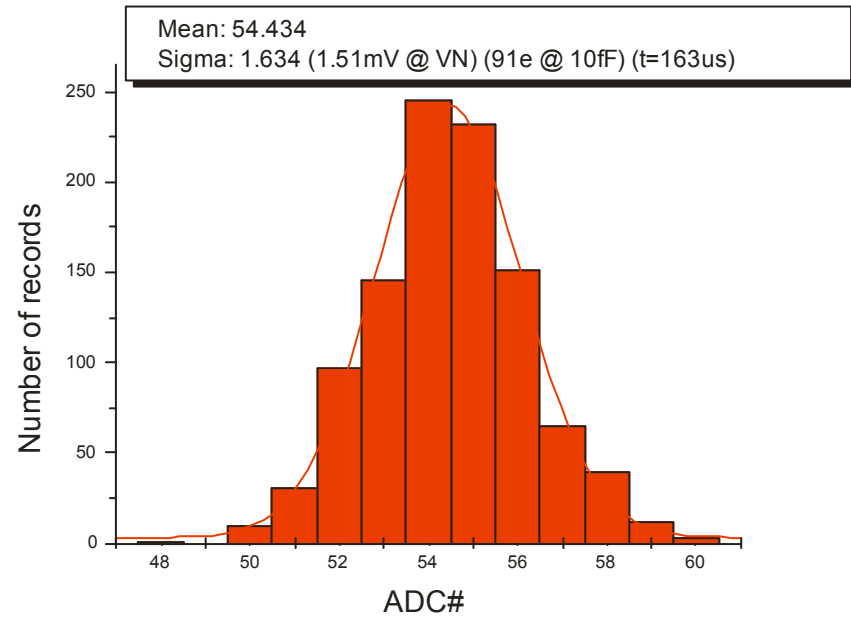
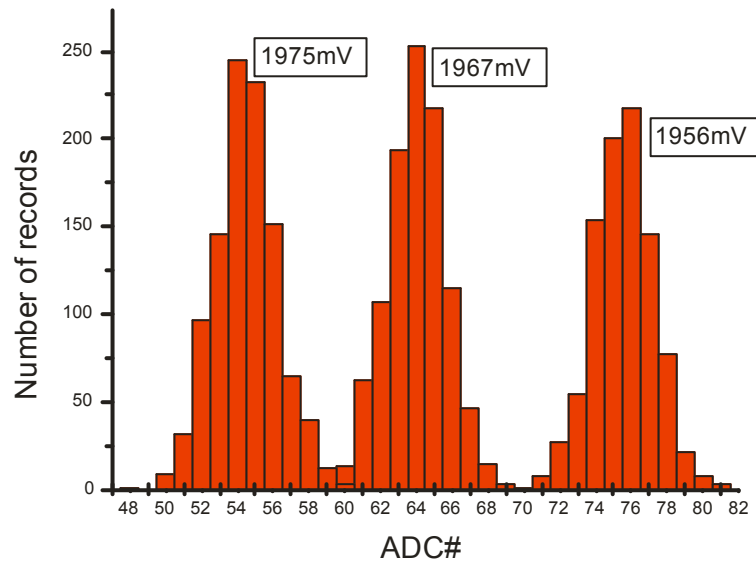


Ramp generator

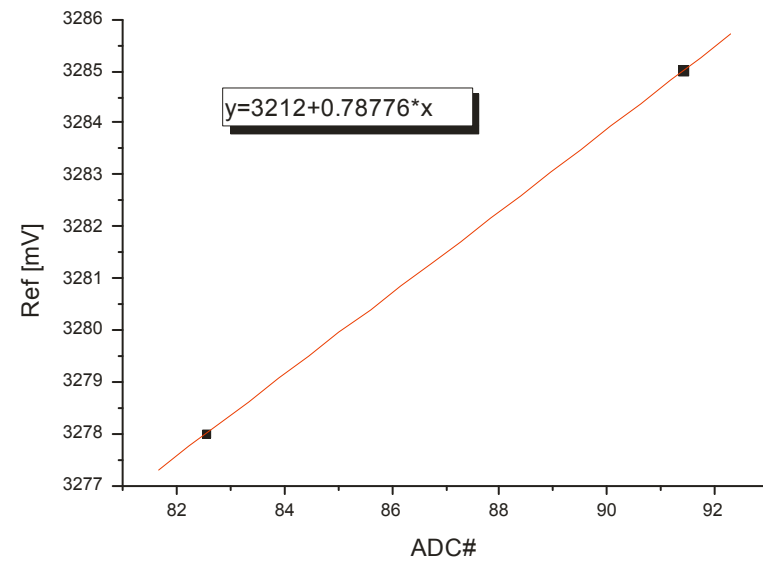
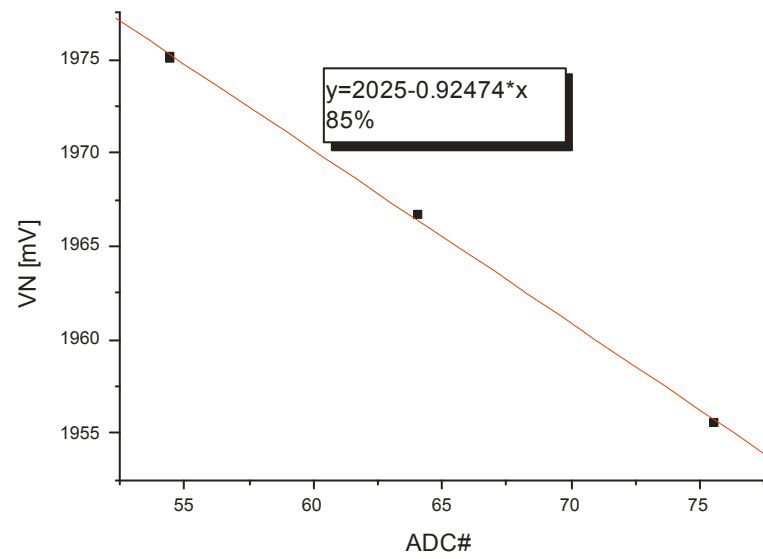




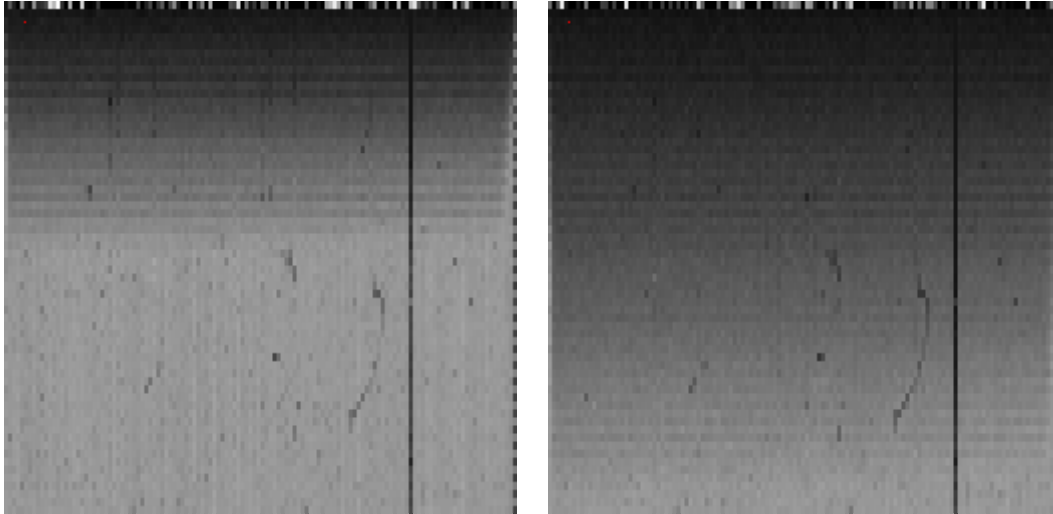
Measurements (preliminary) - noise measurement



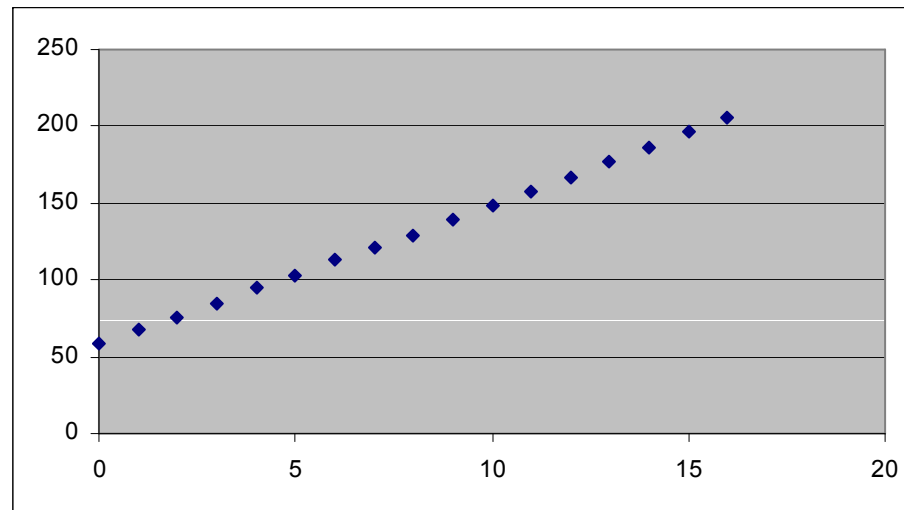
Voltage gain



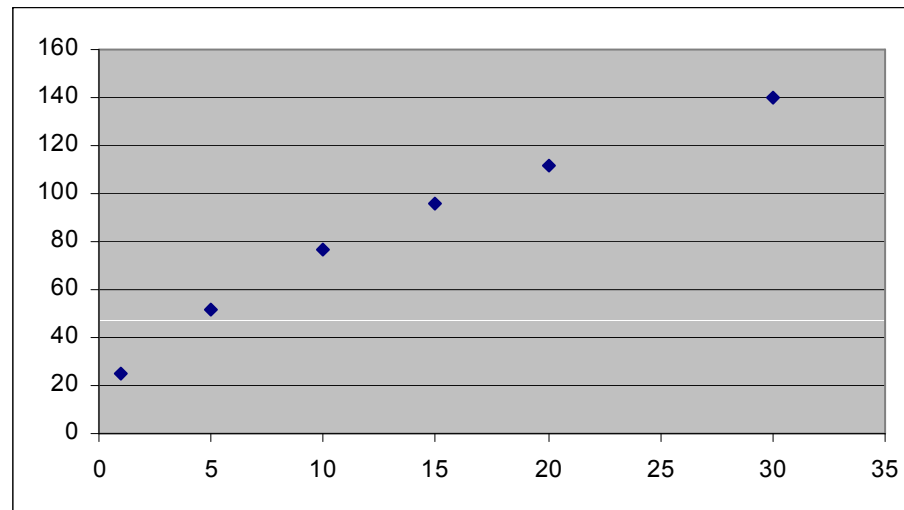
Light pulse measurement



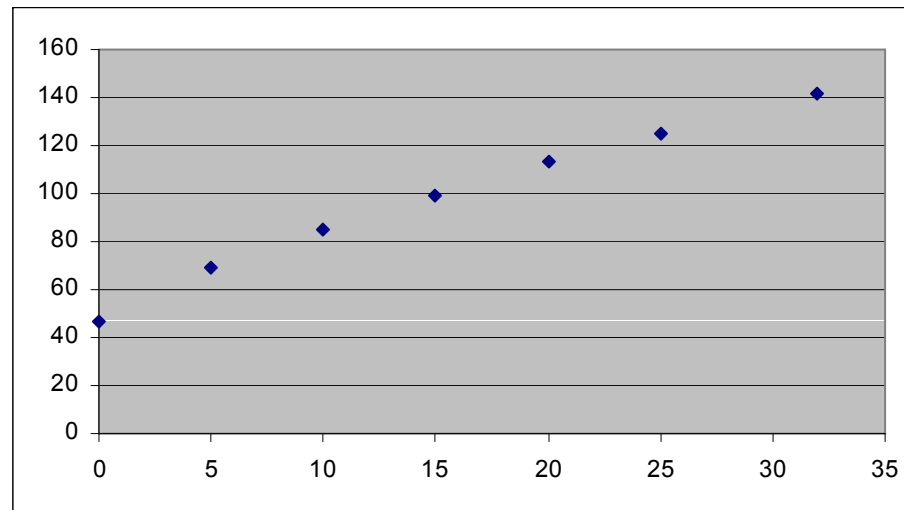
Light pulse measurement



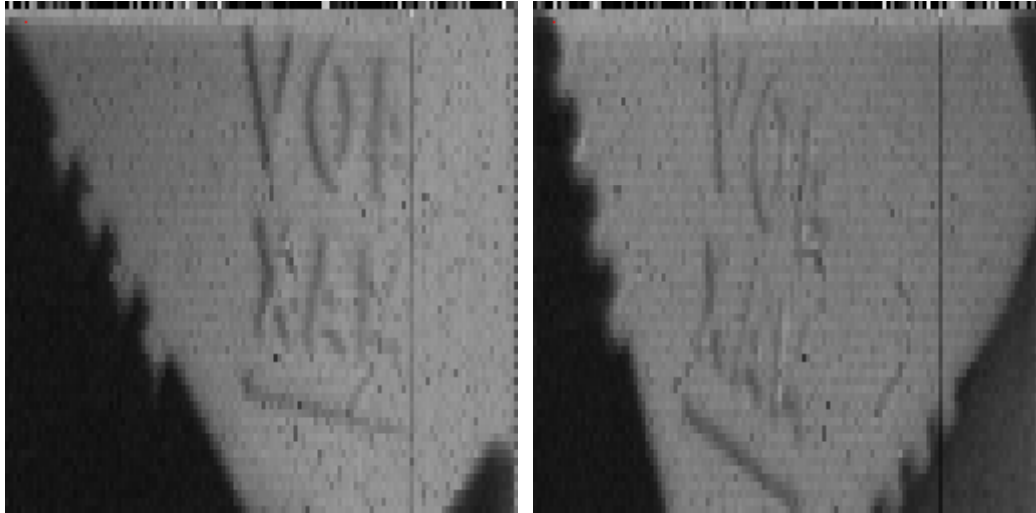
Leakage current vs integration time



Capacitance vs bias voltage

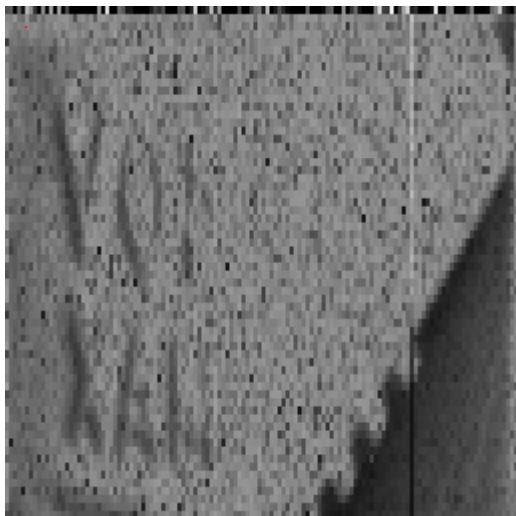


Photographs frame time - 10X320us



10

Frame time 5X320us – different bias voltages



5-20



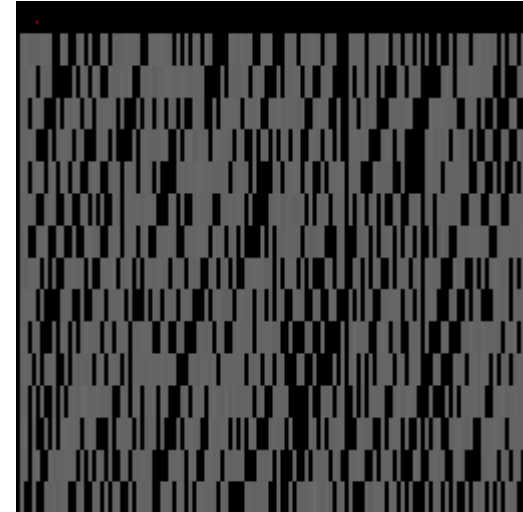
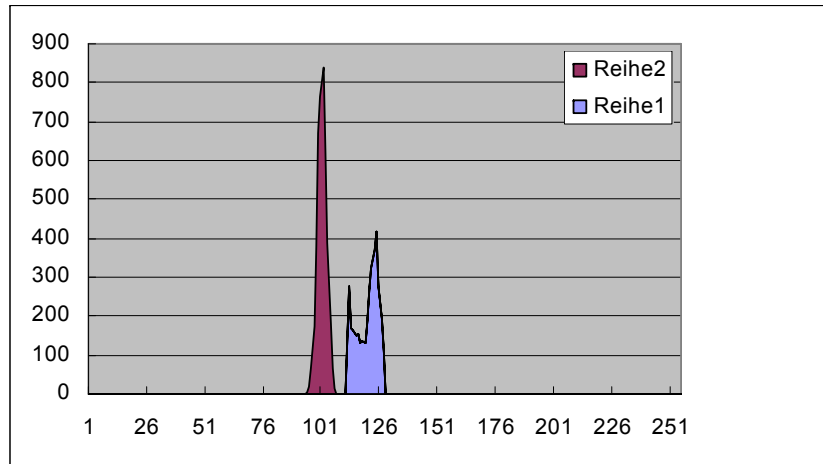
5-10



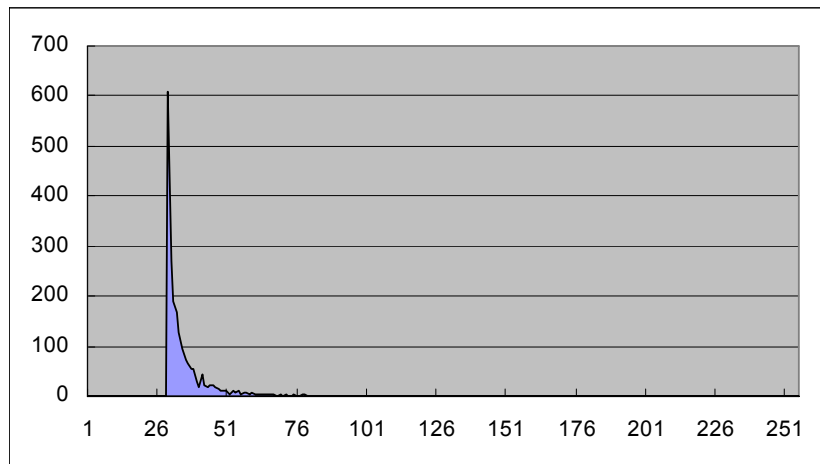
5-0

Fe-55 irradiation – binary readout

Fe-55



CO-60



Thank you!
