HDR Imaging Sensor

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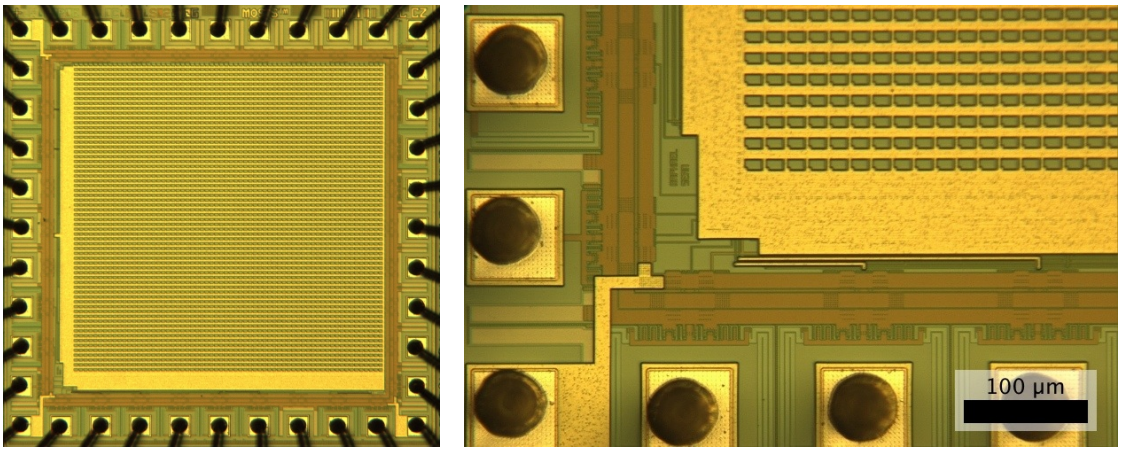

Figure 1: Microscope images of fabricated chip

For the final project of our Mixed Analog and Digital VLSI course, we created a high dynamic range CMOS imaging sensor. The 4 kilopixel imager uses a novel active pixel sensor (APS) design based on previous work by Hsiu-Yu Cheng et al. at the University of Oxford. The pixels have an adjustable response which allows each pixel to have a unique shutter time based on the light intensity. The chip also includes a dynamic decoder circuit and output buffer for readout. The tiny chip unit was fabricated by MOSIS using ON SEMI 0.5-micron technology (17.4x17.4 micron pixels).

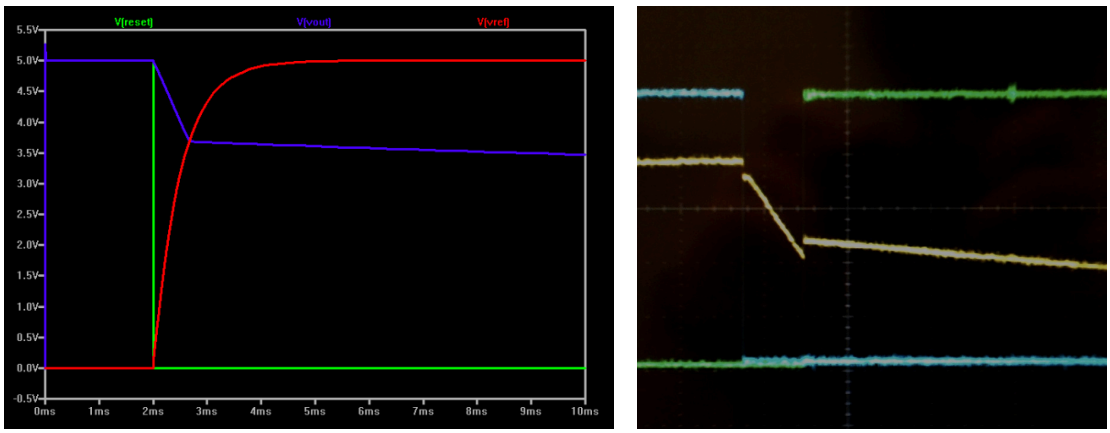

Figure 2: Comparison of simulation and experimental results

We tested the chips by measuring their sensitivity to incoming light. After setting the bias currents, we used an AVR XMEGA microcontroller to send the control signals and perform the analog-to-digital conversion. For our initial testing, we used a set shutter time (step signal). The signal responded appropriately to

changes in the ambient light. In order to test spatial differences, we covered half of the chip and compared pixel values on each side. Initial testing revealed the sensor to work as expected. With appropriate optics, we should be able to generate a full 64x64 pixel image.