

## Fabrication of a Photodetector Array on Thin Silicon Wafers

Kim Manser (RIT, MicroE Co-op)

### Background

- RIDL is designing and fabricating a hybrid CMOS imaging sensor.
- Photodetector and read out circuitry are fabricated on two separate wafers
- The readout integrated circuit (ROIC) has been designed by a team headed by Dr. Zeljko Ignjatovic at the University of Rochester and is being fabricated by an outside facility.
- The photodetector design and fabrication will be done at RIT.
- Photodetector design and fabrication is important for detector performance

### Goals

- Fabricate a photodetector array on thin silicon wafer

### Plan

- Design process flow for photodetector fabrication
- Simulate and optimize process flow
- Fabricate the photodetector

### Device Architecture

- The device is made up of a detector (collects light and generates charge) and the ROIC (translates the detector signals into image information).
- When a photon is incident on the detector, it excites an electron-hole pair, which is freed from the silicon crystal lattice and carried to opposite sides of the device (where the charge is collected in localized areas called pixels).
- The ROIC reads the detector output, which is a signal that is proportional to the incoming flux of light.

### Results

- Designed the process flow
- Fabricated and tested test wafers for optimization of process
  - Measured junction depths
  - Measured resistance
  - Measured film thickness
- Fabricating the photodetector wafers for production of full imaging sensors

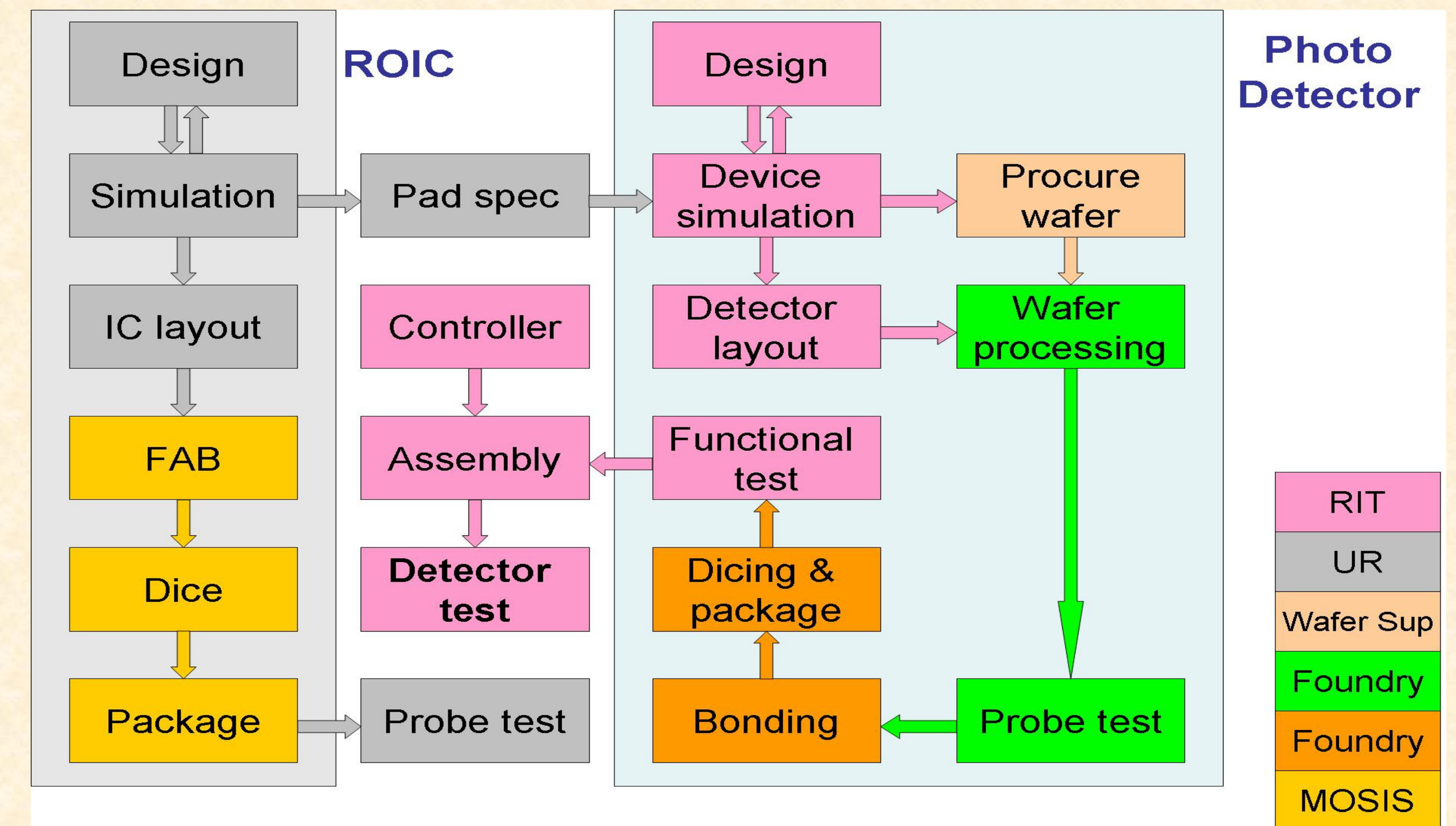


Figure 1: Flow chart of device fabrication and testing

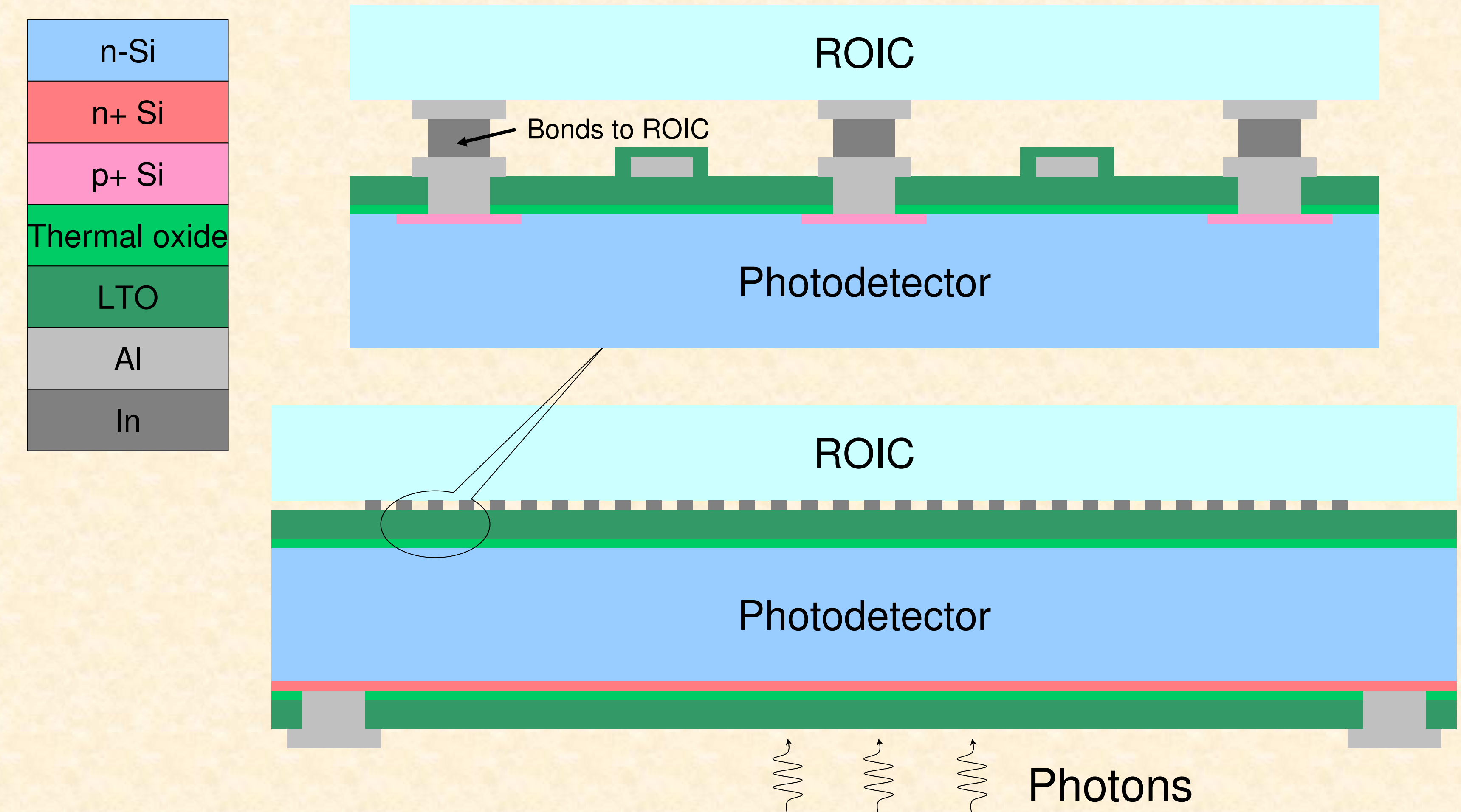


Figure 2: Cross-sectional view of the hybrid CMOS imaging sensor