EURIPIDES Forum 2010 in Paris

September 30th – October 1st, 2010 in Paris

SIMEON

Sensitivity Enhancement for CMOS Image Sensors

Motivation & Objectives

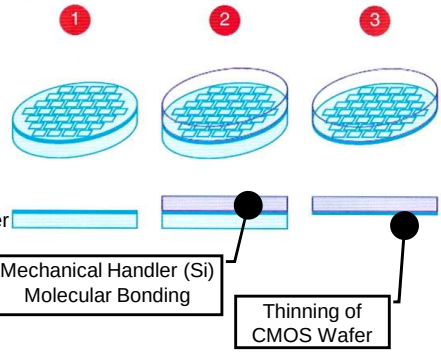
- Improve sensitivity of CMOS image sensors, to be compatible with low illumination levels:
  - Indoor scenes with low light level
  - Short exposure times
  - High-speed imaging
- Develop circuits and technology for small pixels size
- Develop the post process steps for this technology (BSI) (e.g. optical masks, color filters, micro-lenses, …)
- Develop circuitry compatible with High Dynamic Range

Technical challenges
Two routes explored

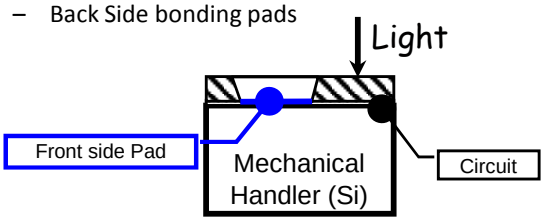
- Front Side Via Wave Guides process (VWG)
- Back Side Illumination (BSI) process with
  - alignment vs. Front Side lithography within 100 nm accuracy
  - bonding pads interconnected with the Front Side circuit
- Develop and apply a wide spectrum Antireflective coating
  - Full Visible Range
- Compatibility of post process steps for color filters and micro-lenses with both techniques

Innovative Process steps

– Back Side Technology



– Back Side bonding pads



– Via Wave Guides

Medium RI filling:

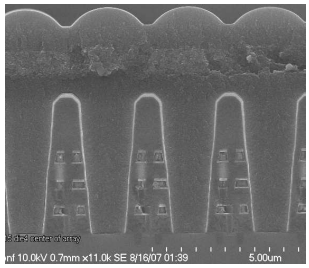
5% improve Response

25% improve in R/G x-talk

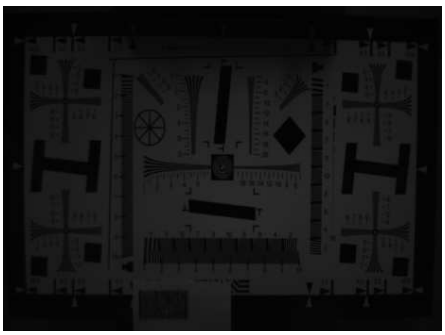
17% improve in B/G X-talk

High RI filling:

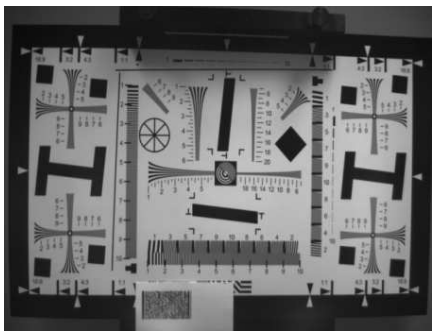
under evaluation



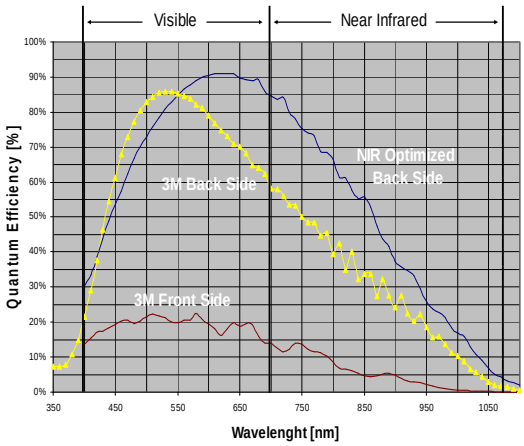
Sensitivity Improvement Results



FRONT SIDE image



BACK SIDE image



QE gain Back Side vs. Front Side

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