Checker-Pattern and Shared Two Pixels LOFIC CMOS Image Sensors

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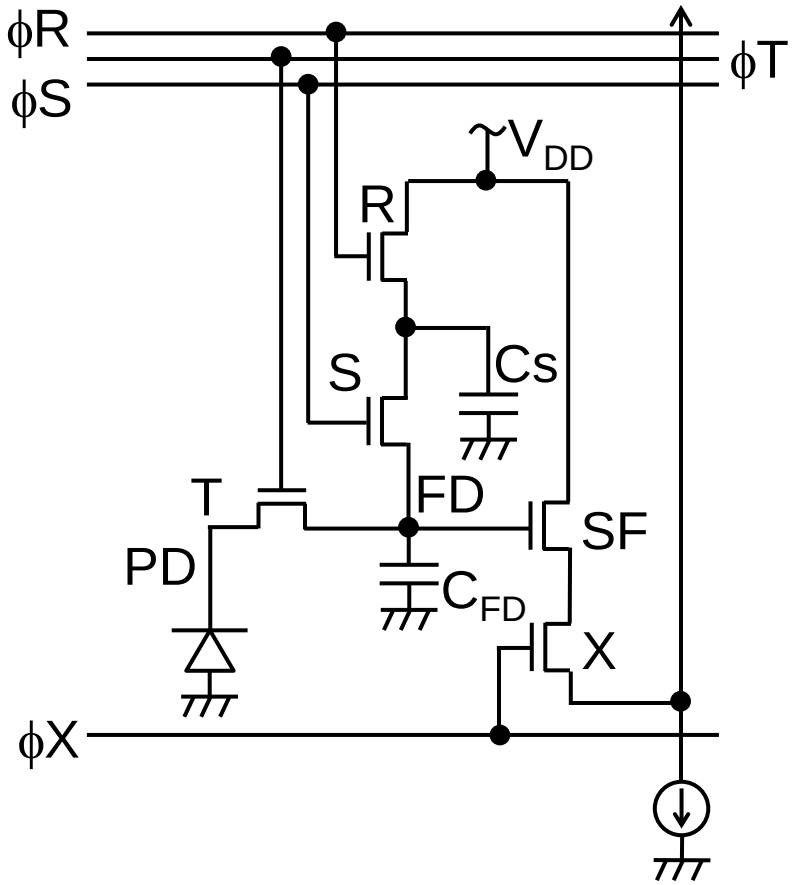
Background

Lateral Overflow Integration Capacitor (LOFIC) CMOS Image Sensor[*1]

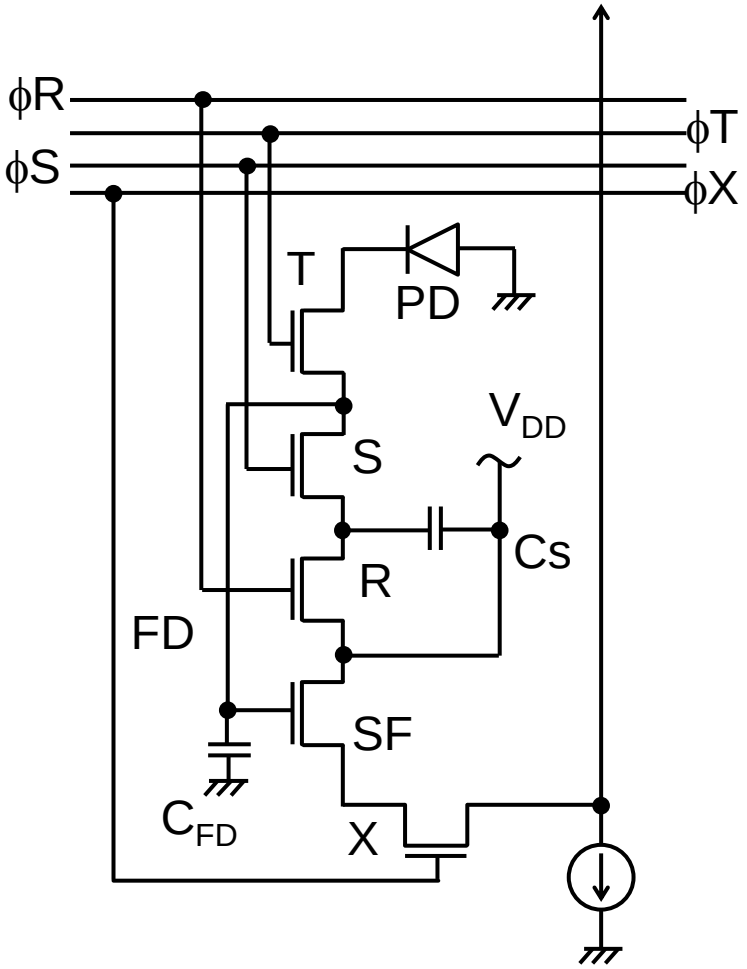


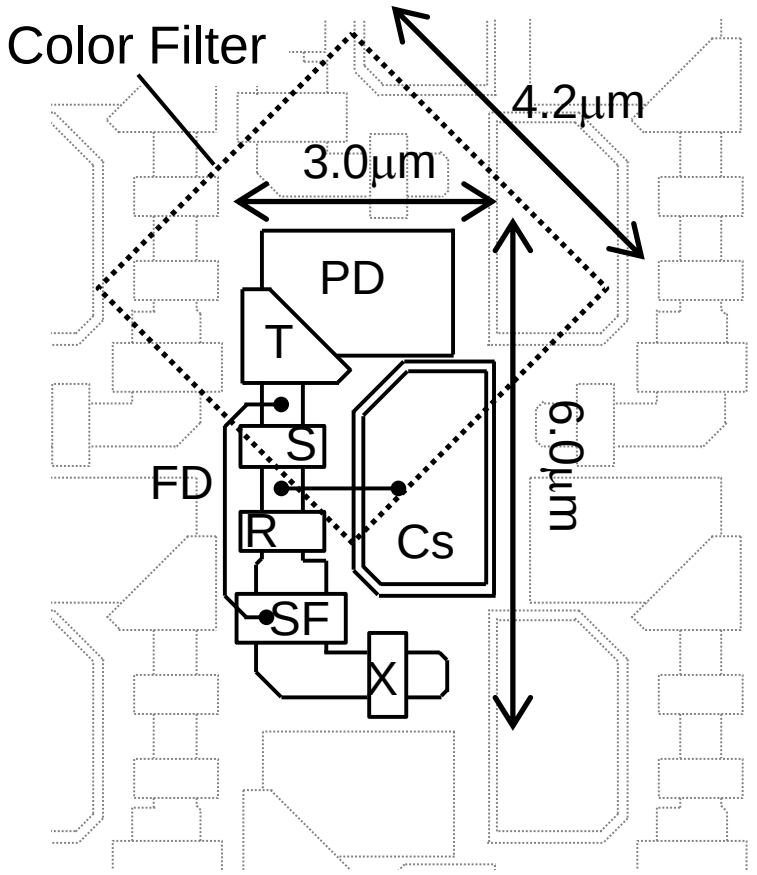
- **High Sensitivity**
  - **200-μV/e⁻[*2]**
- **High Full Well Capacity**
  - **237-ke⁻[*3]**
- **Low Dark Current**
  - **0.35-e⁻/sec·μm² [*3]**
- **Low Resolution**
  - **4.5×4.5-μm² pixel size[*4]**

Pixel scaling is a very hard challenge because of the additional components switch S and Cs

*1 S. Sugawa, et al., ISSCC, 2005. *2 S. Adachi, et al., JSSC, 2008.
*3 K. Mizobuchi, et al., SPIE, 2008. *4 K. Mizobuchi, et al., int. Image Sensor Workshop, 2009.

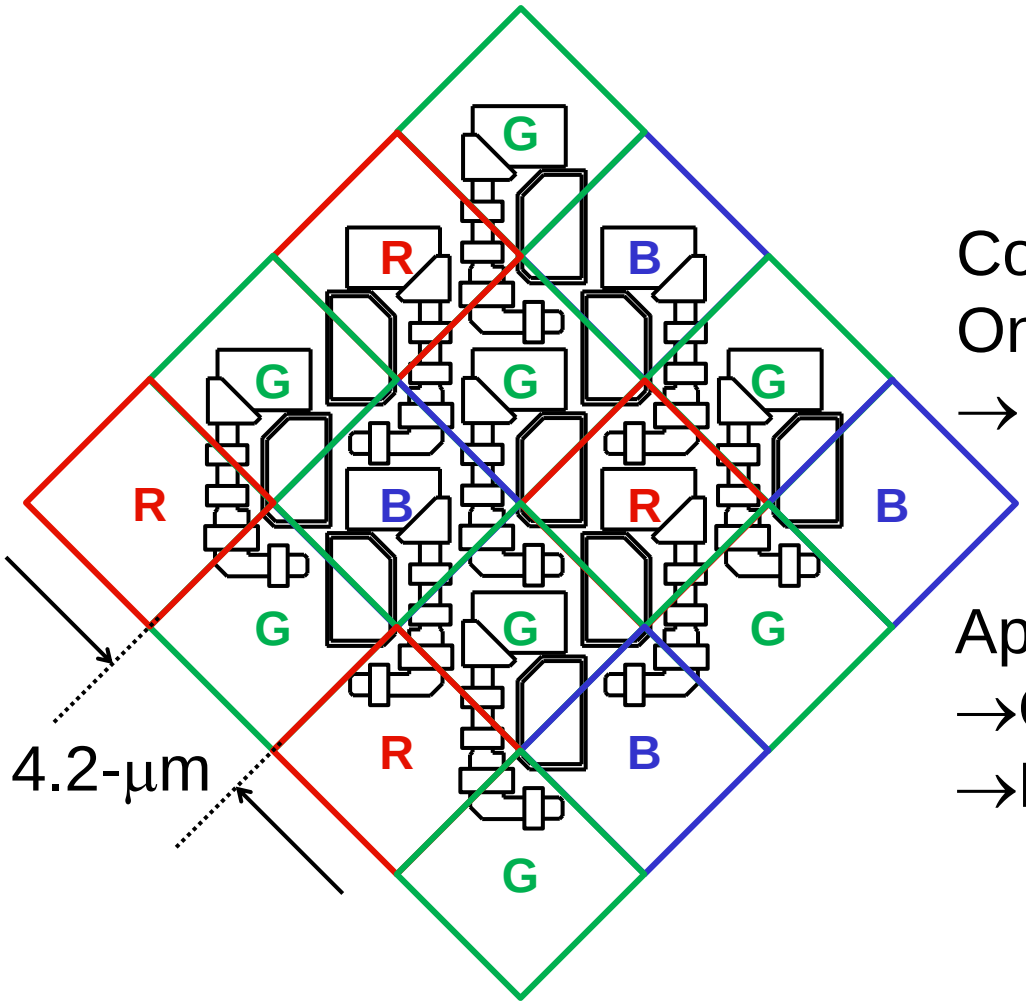
Checker-Pattern LOFIC CMOS Image Sensor





Rectangle Pixel Structure : High Area Efficiency
Large Size PD : High Sensitivity

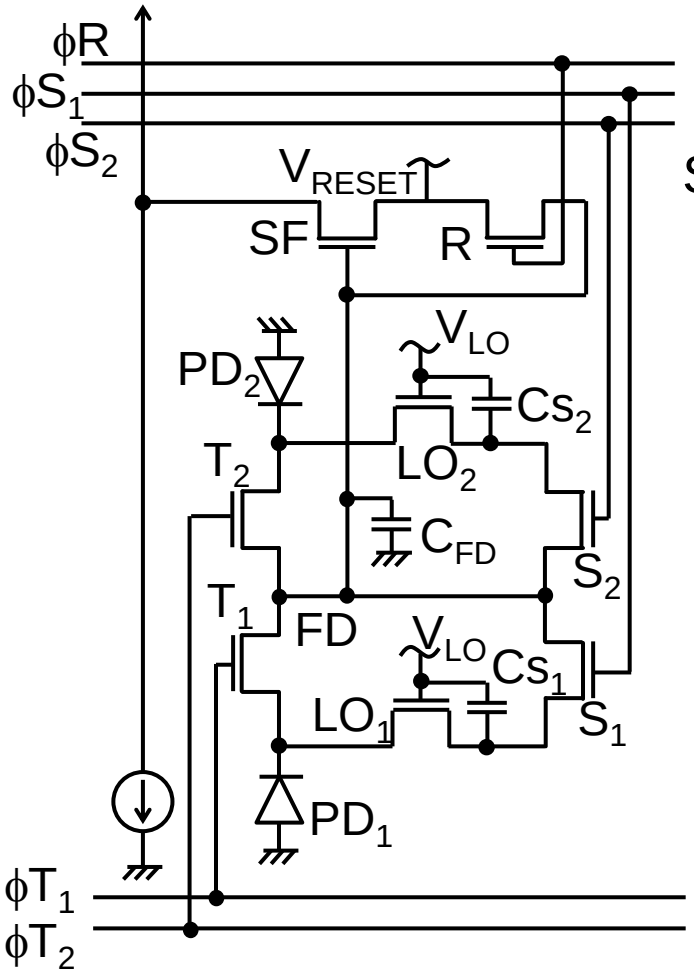
Color Filter and On-chip Micro-lens Array Diagram

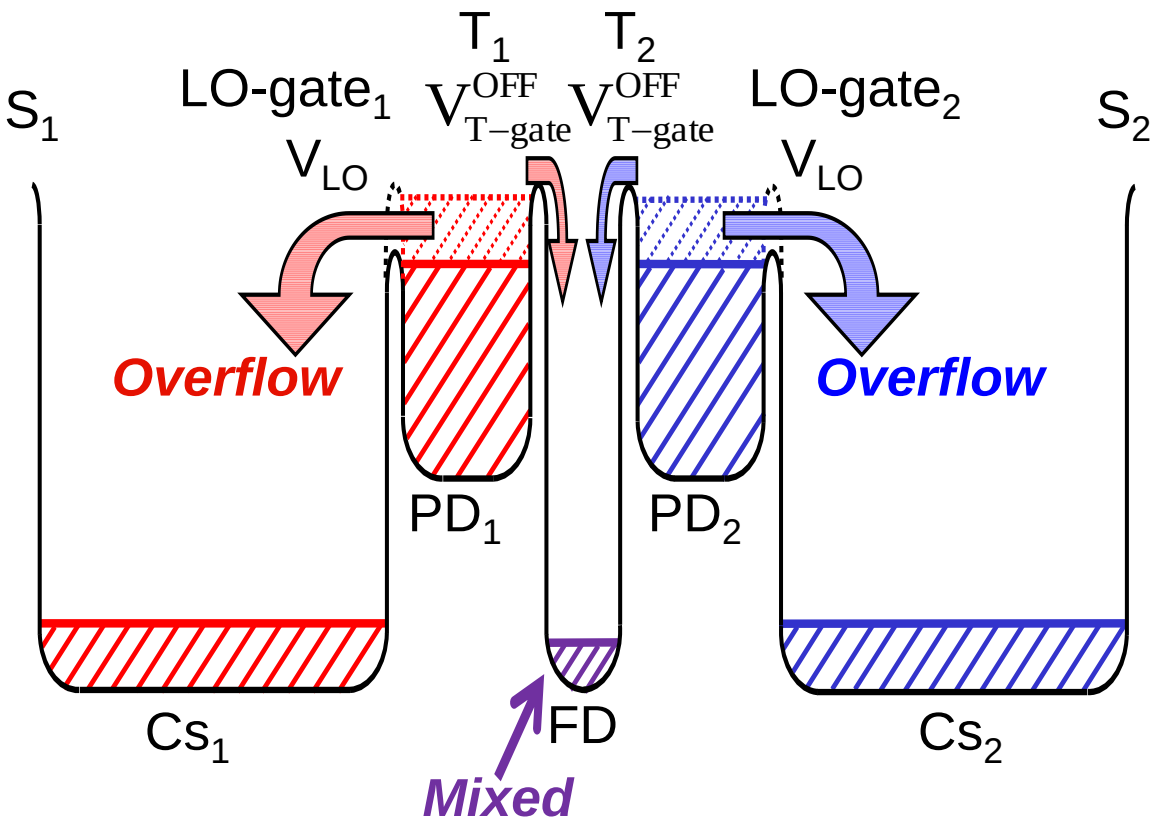


Color Filter and
On-chip Micro-lens Arrangement
→ no photon loss

Appropriate Signal Processing
→Good Color Reproductivity
→High Effective Resolution

Shared Two Pixels LOFIC CMOS Image sensor*5

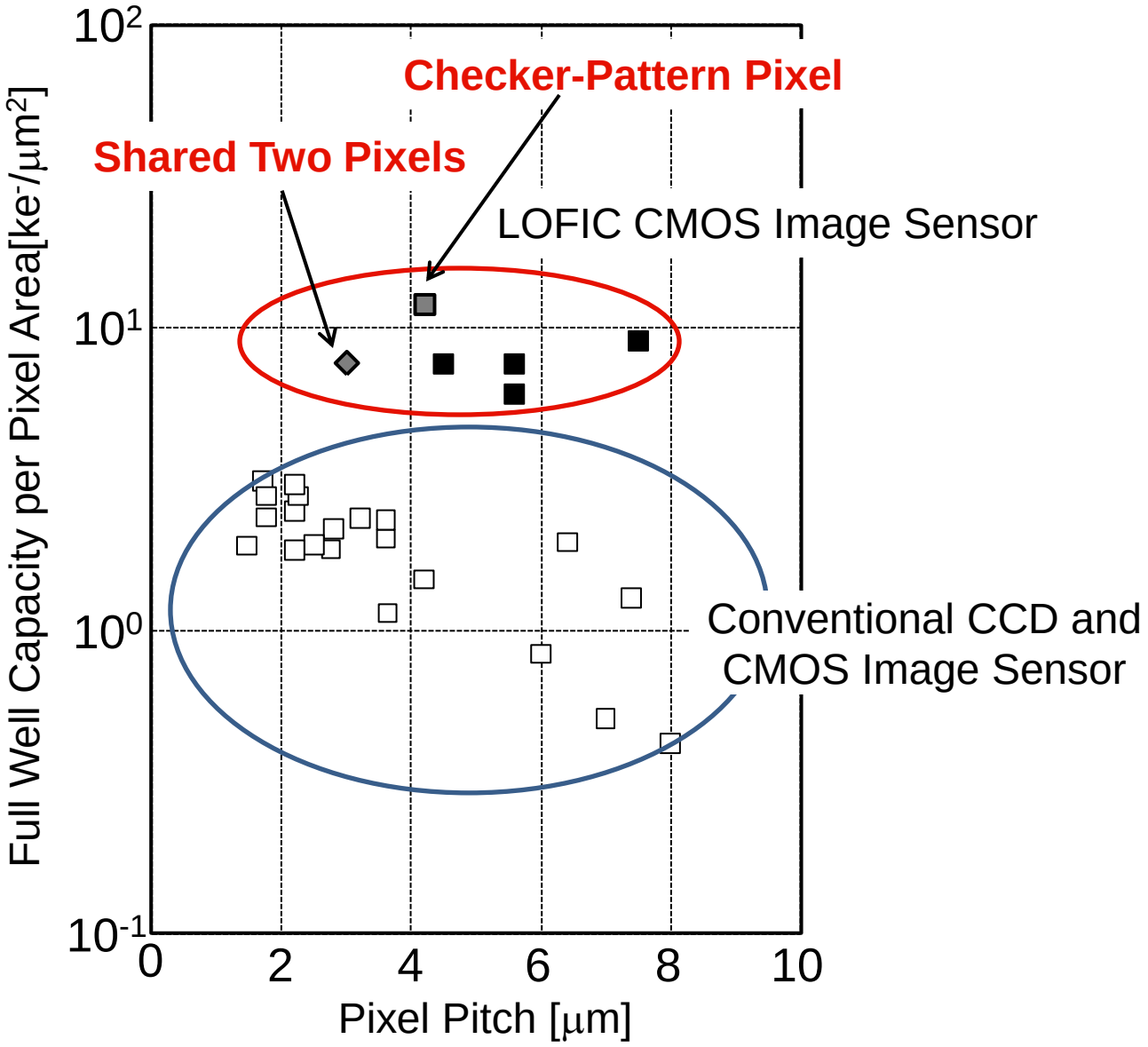




Sharing Pixel Components : High Resolution
LOFIC Technology : High Full Well Capacity

*5S .Sakai, et al., ESSCIRC, 2009

Relation between Full Well Capacity and Pixel Pitch*4



Conclusion

New Two LOFIC CMOS image sensors having scaled pixels, checker pattern pixel and shared two pixels, have been developed.

These image sensors have achieved high sensitivity, high full well capacity and wide dynamic range performances, and show higher resolution performances compared to the conventional sensors in spite of using the same CMOS technology.