A Monolithic Digital Sun Sensor with Integrated Window Layer

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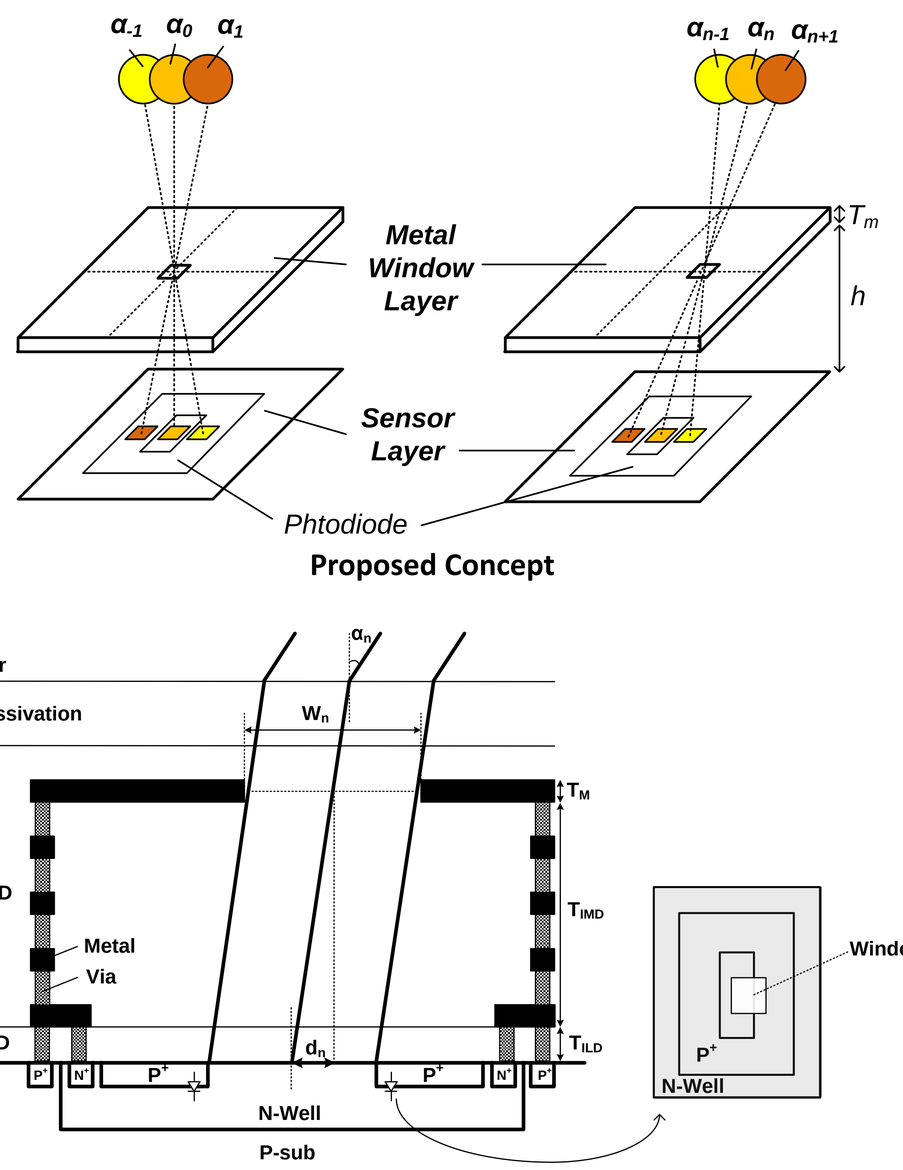
I. Abstract

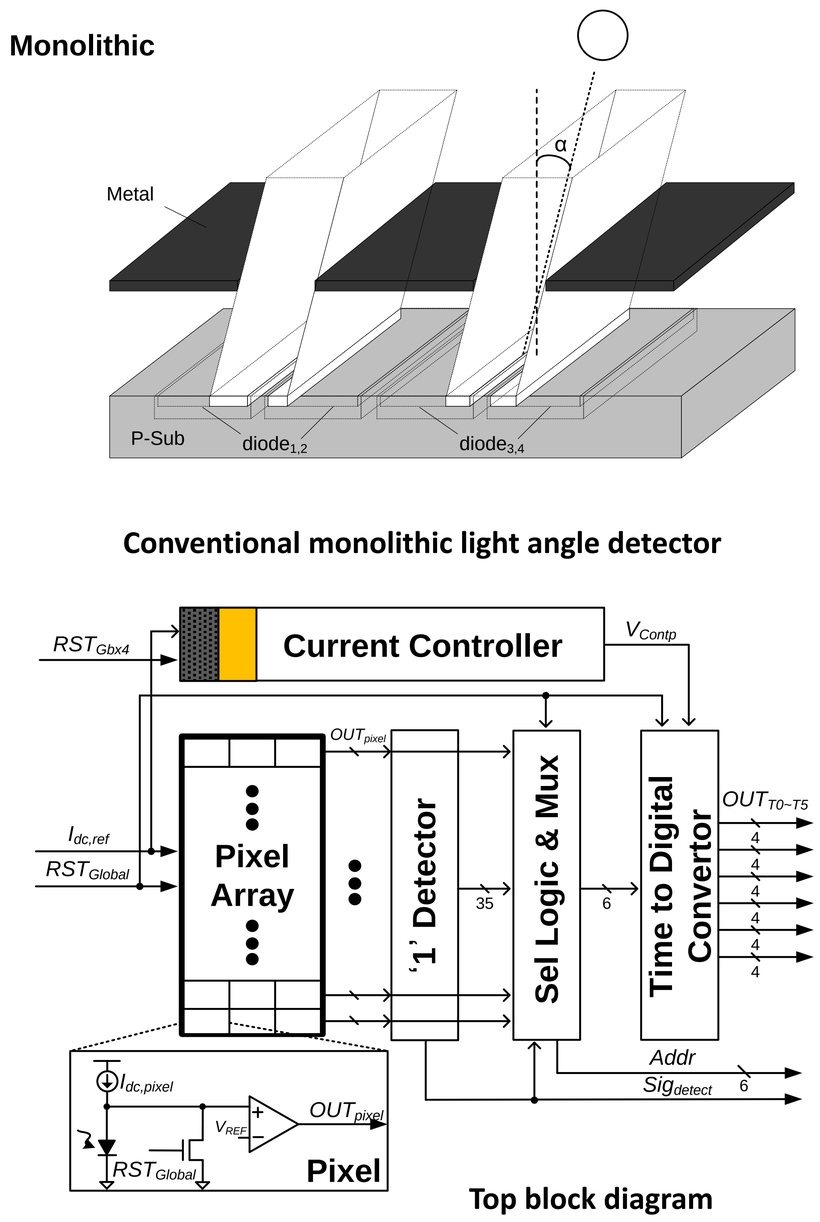
- The sun sensor is used for nano-satellites, spacecraft, solar power plants, heliostats and so on
- Proposed structure could reduce the mismatch of two different photodiodes in conventional work
- Implemented in 0.18μm CMOS process, occupies 1.7x1.4mm^2 core size and consumes less than 182μW

II. Proposed Work



Proposed Concept

Proposed single sensor cell structure with single photodiode

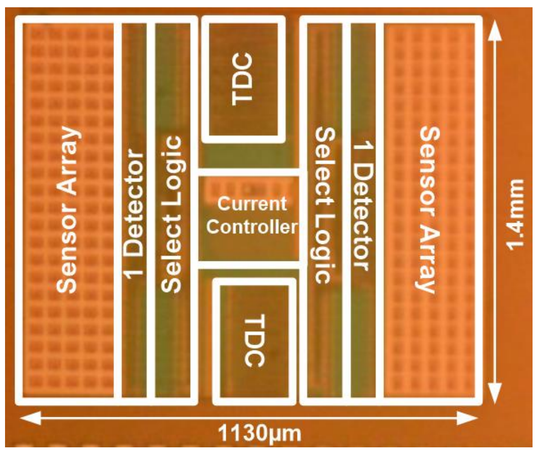


Conventional monolithic light angle detector

Top block diagram

- Separated implementation of window layer in conventional work has disadvantage at mass production
- Conventional monolithic light angle detector is vulnerable to mismatch
- Proposed work could reduce the effect of mismatch by integration of single photodiode with a single sensor cell
- Incidence of light path was modeled with BEOL(Back end of Line) consideration
- Consideration of changing light intensity and fine detection is added in this work

III. Implementation



Photomicrography

V. Conclusion

- Integrated window layer and sensor array was implemented in 0.18um CMOS process
- Current controller circuit was added to prepare for situation with light intensity variation in this work
- Proposed sun sensor consumes less than 182μW