

Optical Characteristics of an N-Well/Gate-Tied PMOSFET-type Photodetector with Built-in Transfer Gate for CMOS Image Sensor

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(Received July 4, 2007; accepted September 27, 2007)

Key words: photodetector, PMOSFET, built-in transfer gate, CMOS image sensor

In this study, a new n-well/gate-tied p-channel metal-oxide-semiconductor field-effect transistor (PMOSFET)-type photodetector with a built-in transfer gate has been designed and fabricated using 0.35 μm standard complementary metal oxide semiconductor (CMOS) technology. This photodetector is composed of a floating gate that is tied to an n-well and a built-in transfer gate. The built-in transfer gate controls the photocurrent flow by controlling the barrier for holes in the proposed photodetector. The designed and fabricated photodetector exhibits $I_{\text{DS}}-V_{\text{DS}}$ characteristics that are similar to those of a general MOSFET when the incident light power, instead of the gate voltage, is varied. The area of the proposed photodetector is $3.8 \times 5.7 \mu\text{m}^2$ and the responsivity is greater than 2.5×10^2 A/W, at a wavelength of 633 nm.

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