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SpacePix3: SOI MAPS Detector for Space Radiation Monitoring

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Radiation in space is a potential risk to human health and electronic systems. SpacePix3 is a high voltage monolithic active pixel sensor (HV-MAPS) ASIC capable of measuring flux and deposited energy in pixels, distinguishing between types of radiation, protons, electrons, and ions. SpacePix3, improved version of the SpacePix2, features 64×64 pixel matrix with a pixel pitch of $60 \mu\text{m}$ and a total sensitive area of $3.84 \times 3.84 \text{ mm}^2$. New measured data of implemented SpacePix3 prototype are provided. Analog signals from pixels are digitized by 32 10-bit column ADCs with successive approximation register (SAR). The total power consumption is 43 mA from a 1.8 V power supply. Sensor diodes are biased at -150 V. Special SpacePix3 features are backside channel signal processing, SPI/LVDS readout modes, hit trigger output, debugging features, thermometer, radiation-hardened design, multichip operation, and analog pixel output. The chip is manufactured in a 180 nm SOI technology.

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