



Sensor Circuits for X-Ray Imagers

TECHNOLOGY NUMBER: 7172



Technology ID

7172

Category

Manufacturing Process
Engineering & Physical Sciences
Semiconductors, MEMS, and
Electronics

Inventor

Aunnasha Sengupta
Chumin Zhao
Jerzy Kanicki
Mao-Hsun Cheng

Further information

Joohee Kim
jooheek@umich.edu

OVERVIEW

Current-mode active-pixel sensor circuit for high-quality x-ray imaging

- Reduces noise, increases transistor density, enhances image sharpness
- Applicable to medical imaging, nondestructive testing, security screening

BACKGROUND

Digital x-ray imaging systems are critical in fields like medical diagnostics, nondestructive testing, and security screening. These systems include an x-ray source and a detector to create images of internal structures. With over 240 million medical x-ray procedures annually, optimizing the efficiency and quality of these systems is paramount. Traditional flat panel x-ray detectors use thin film transistors and indirect conversion systems to convert x-ray energy into electrical signals. These systems, however, face challenges such as noise and low transistor density, which degrade image quality and resolution. Therefore, a need exists for enhanced detector designs that offer higher signal-to-noise ratios and better image sharpness without compromising system performance.

INNOVATION

Researchers have created a design for a current-mode, active-pixel sensor circuit that is tailored to large-area x-ray imagers. This design improves signal-to-noise ratios and maintains performance integrity even at higher transistor densities. Featuring a 50-micrometer pixel pitch,

[View online](#)



the technology ensures superior image sharpness and clarity. Supported by simulations and mathematical analyses, the new design demonstrates improvements over existing systems. The applicability of this technology spans the medical sector (enhancing diagnostic imaging), industrial sector (improving nondestructive testing accuracy), and security field (providing clearer images for screening). This innovation promises to elevate the standards and efficacy of x-ray imaging systems across various industries.