

## Pixel-level analog-to-digital conversion for LWIR FPA

*P. A. Kuznetsov, A. N. Kuznetsov and Yu. A. Yakimov*

Orion R&P Association, JSC  
9 Kosinskaya st., Moscow, 111538, Russia

*Received December 19, 2022*

*Variants of circuitry for storage cells with analog-to-digital conversion in matrix FPAs in the long-wave infrared range are considered. The necessity of a multiple increase in the charging capacity of the storage cell to improve the threshold characteristics of the FPA is substantiated. A new version of the storage cell with analog-to-digital conversion is proposed, which has a number of advantages over analogues: high linearity, low consumption, low noise. The results of the study of a test crystal of a CMOS readout integrated circuit manufactured using the HCMOS8D technology of “Mikron” with a design standard of 0.18  $\mu\text{m}$  are presented.*

*Keywords:* FPA, ROIC, analog-to-digital conversion.

DOI: 10.51368/2307-4469-2022-10-6-577-583

### REFERENCES

1. X. Lui and A. El Gamal, Proceedings of SPIE **4669**, 304–312 (2002).
2. B. Fowler, A. El Gamal and D. Yang, *A CMOS Area Image Sensor with Pixel-Level A/D Conversion*, in ISSCC Digest of Technical Papers. (CA, San Frasco, 1994).
3. A. Kitchen, A. Berma and A. Bouzerdoun, IEEE Electron Device Lett. **25** (7), 471–473 (2004).
4. A. Kitchen, A. Berma and A. Bouzerdoun, Electron Devices, IEEE Transactions on Electron Devices **52** (12), 2591–2601 (2005).
5. B. Fowler, A. El Gamal and D. Yang, IEEE Journal of solid-state circuits **34** (3), 348–355 (1999).
6. K. I. Schultz, V. W. Kelly, J. J. Baker et al., Lincoln Laboratory Jour. **20** (2), 36 (2014).
7. I. I. Lee, Usp. Prikl. Fiz. **6** (5), 417 (2018).
8. A. V. Zverev, Y. S. Makarov, E. A. Mikhantiev and S. A. Dvoretzki, Autometria **52** (4), 79 (2016).
9. P. A. Kuznetsov and I. S. Moschev, Usp. Prikl. Fiz. **2** (1), 83 (2014).
10. Arnaud Peizerat, Marc Arques, Patrick Villard and Jean-Luc Martin, *Pixel-level A/D conversion: comparison of two charge packets counting techniques* in International image sensor workshop (LETA-CEA, Grenoble, France), 2007, pp. 200–203.
11. S. Bisotto, A. Peizerat et al., Proc. SPIE **7834**, 76603T (2010).
12. Products “AIM Infrarot Module”, LWIR IDCAs, aim-ir.com.