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Zhi-Wei Lai, Po-Hua Huang, and Kuen-Jong Lee, "Using both Stable and Unstable SRAM Bits for the Physical Unclonable Function," Journal of Electronic Testing: Theory and Applications, Volume 38, Number 5, pp. 511–525, October 2022

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Abstract Recently Physical Unclonable Functions (PUFs) of IC chips have been used in electronic systems for secret key generation and device authentication. Among all available PUFs, SRAM PUF is a popular one because SRAM is a standard component for most electronic devices, and it possesses good randomness during power-on. Previously only strongly stable SRAM bits are selected as PUF bits, which generally requires a large number of SRAM bits. Furthermore, SRAM PUFs may suffer from PUF clone attacks as attackers may use the Photon Emission Analysis (PEA) device to observe the behavior of stable bits and conduct circuit edit via Focused Ion Beam (FIB) to produce identical PUFs. In this paper we propose two methods that employ unstable bits as PUF bits in addition to stable bits to increase the SRAM bit usage rate. These two methods can resist the PUF clone attack as it is very difficult to reproduce unstable bits. Extensive experiments have been conducted, and the results show that though unstable bits are used, high reliability is still achieved.

Zhi-wei Lai graduated from the National Cheng Kung University with a master's degree in electrical engineering (2020). He is currently working at Realtek Semiconductor Co.as an R&D engineer, specializing in memory and DSP-related development.

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