

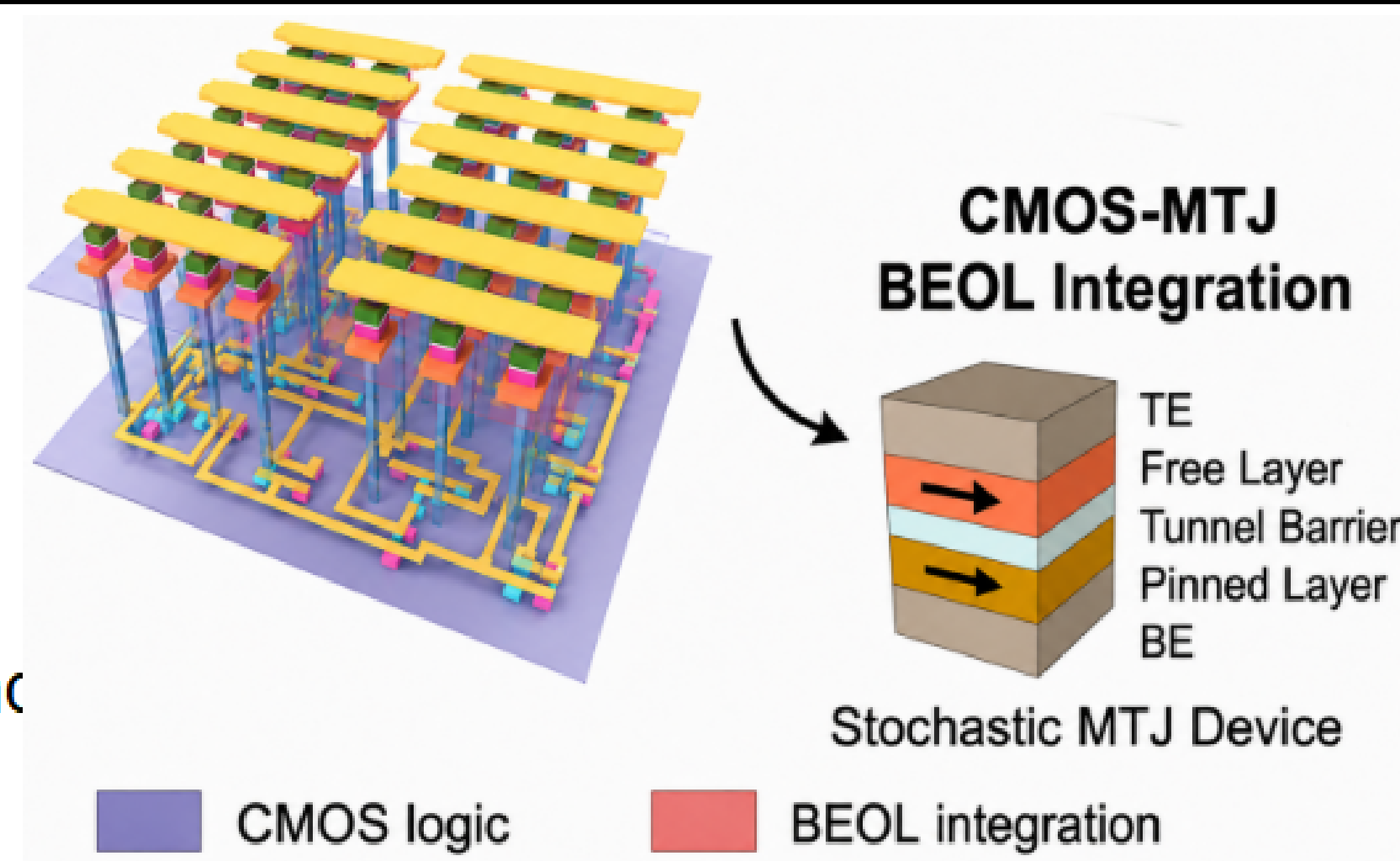
BEOL-Compatible stochastic MTJ-CIM For DAC-less Ising Machine

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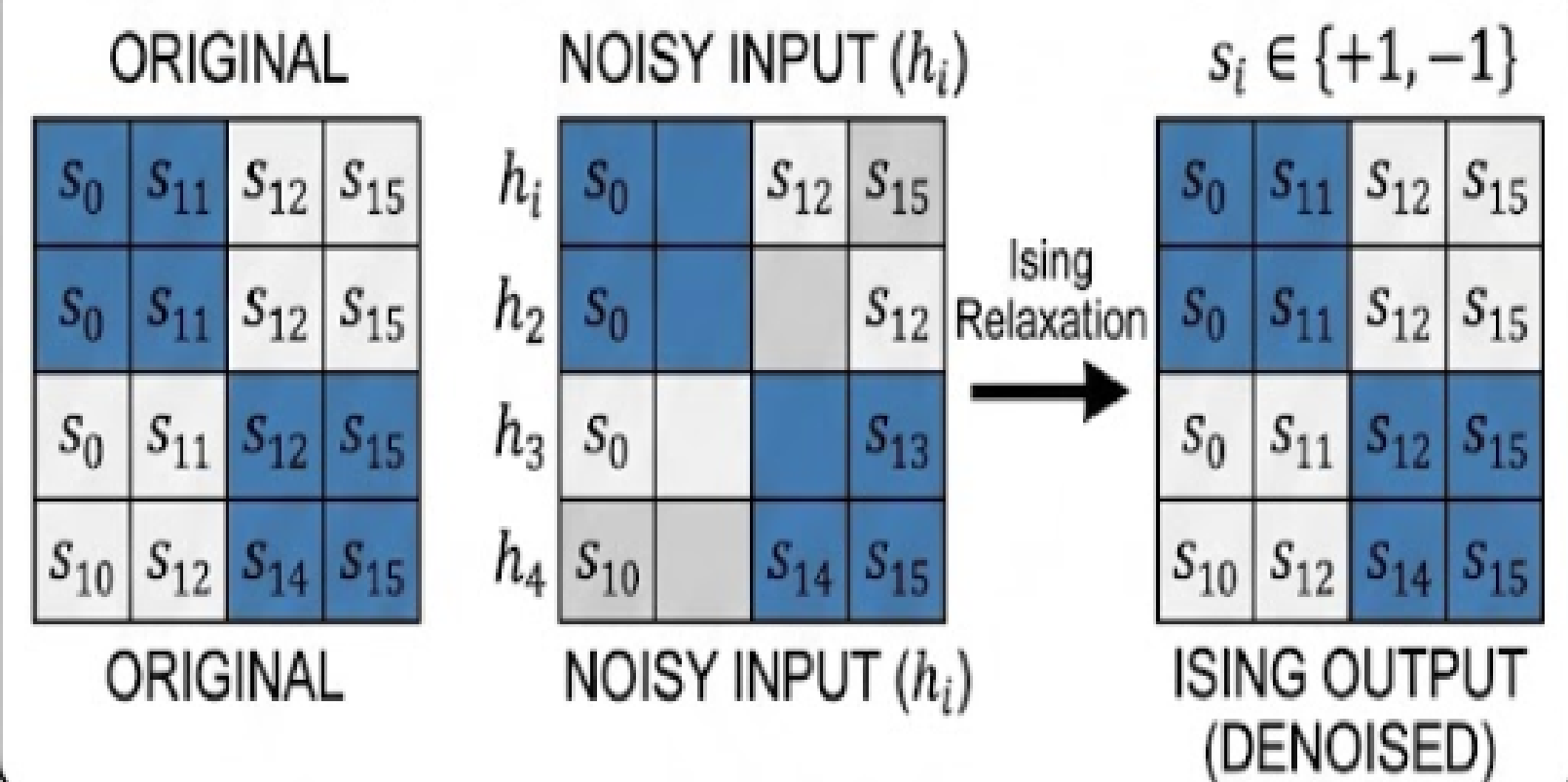
Monolithic 3D Integration of MTJ & Analog Circuit

We develop an analog probabilistic computing circuit that integrates an eDRAM-based CIM core with BEOL stochastic MTJs. The eDRAM array performs analog in-memory computation while serving as an embedded DAC interface, and the MTJs provide intrinsic stochasticity for probabilistic sampling and computation.

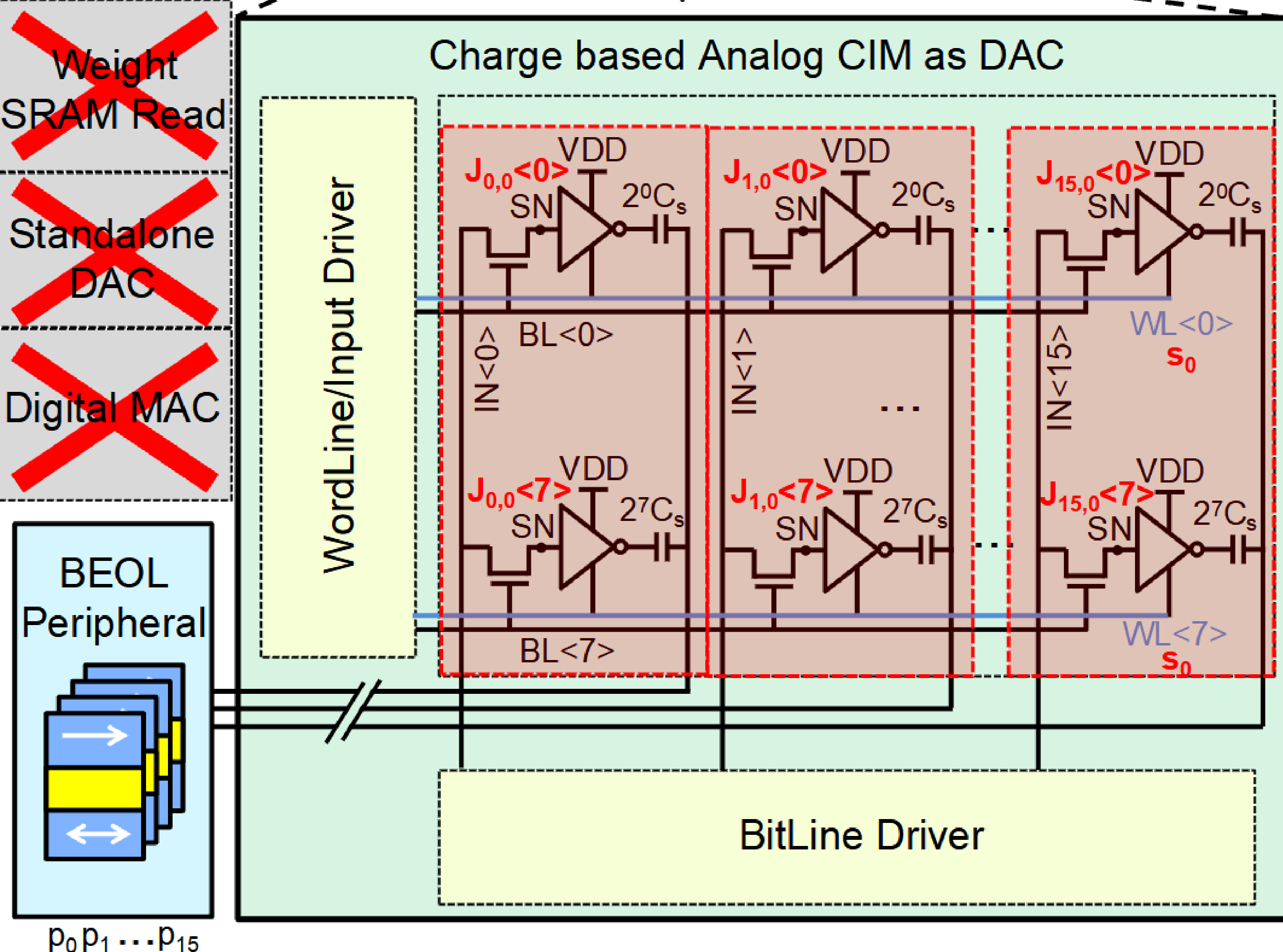
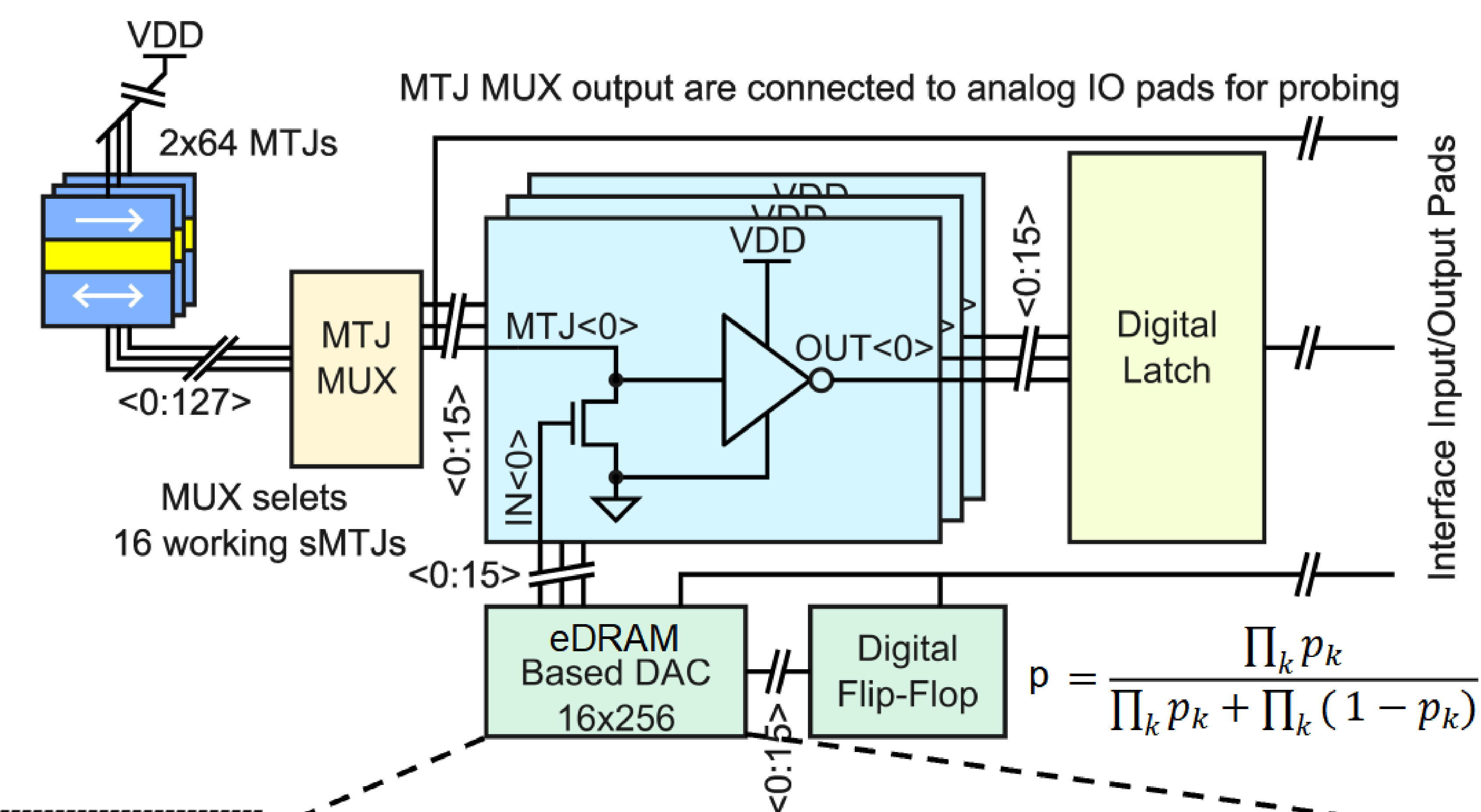
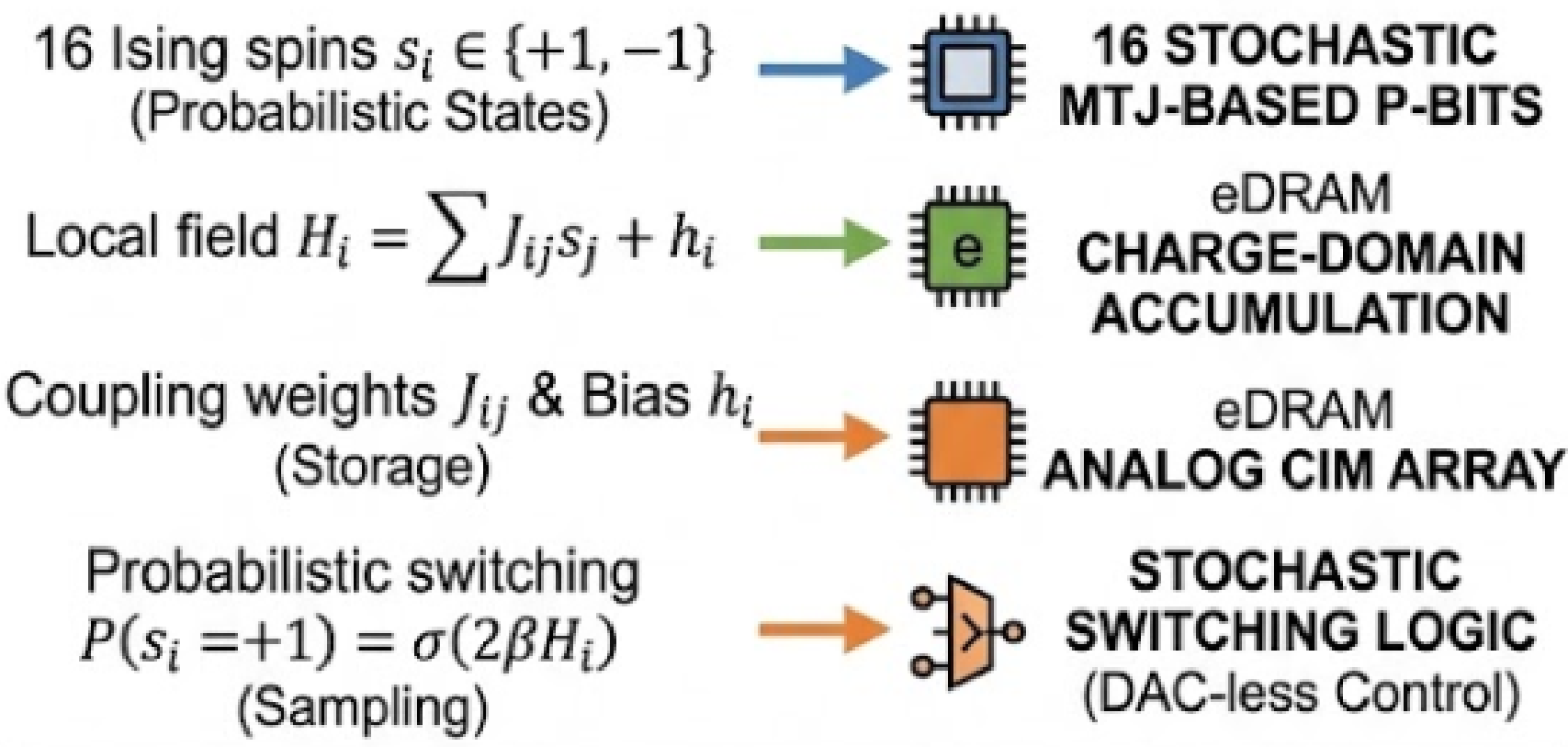


Stochastic MTJ-CIM For DAC-less Ising Machine

PROBLEM FORMULATION: 4x4 BINARY IMAGE DENOISING



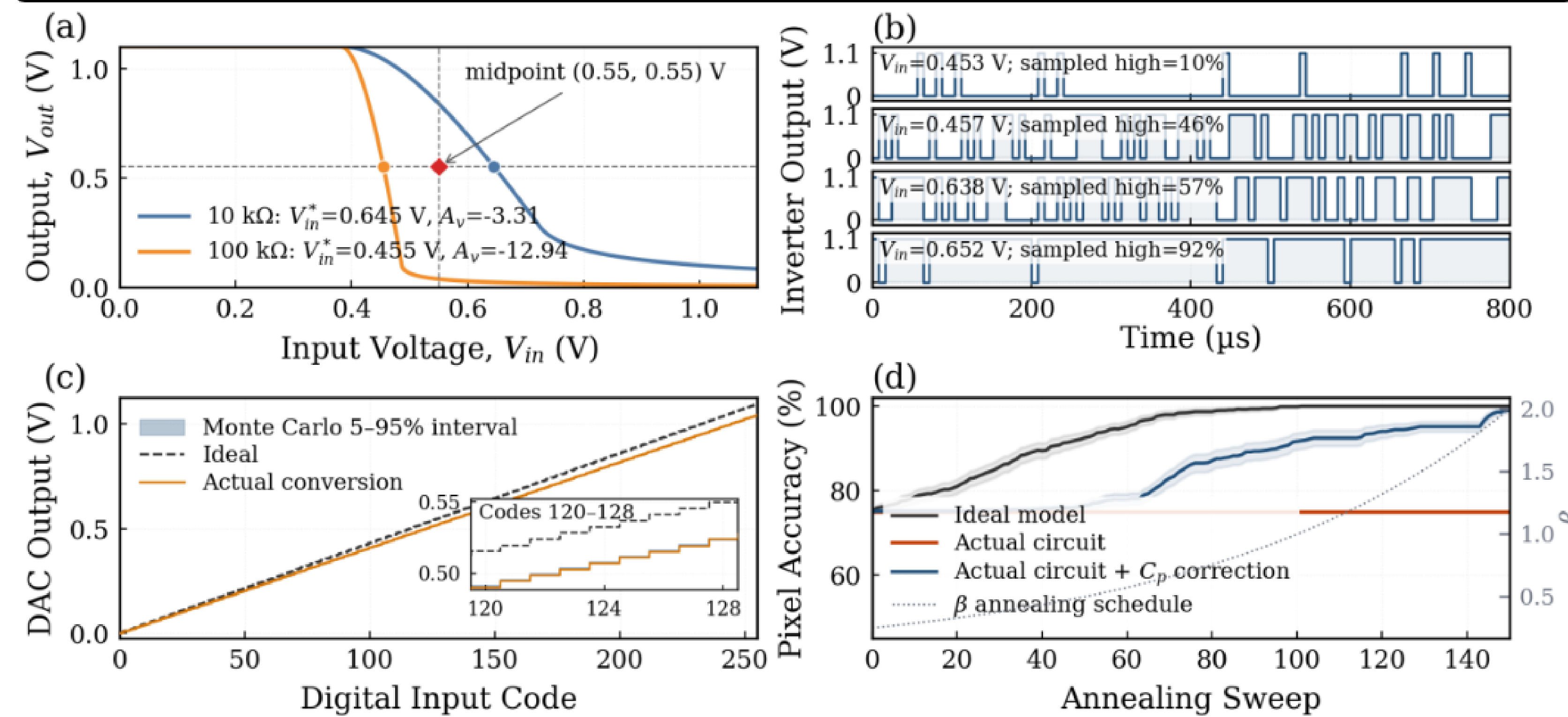
APPLICATION-TO-HARDWARE MAPPING



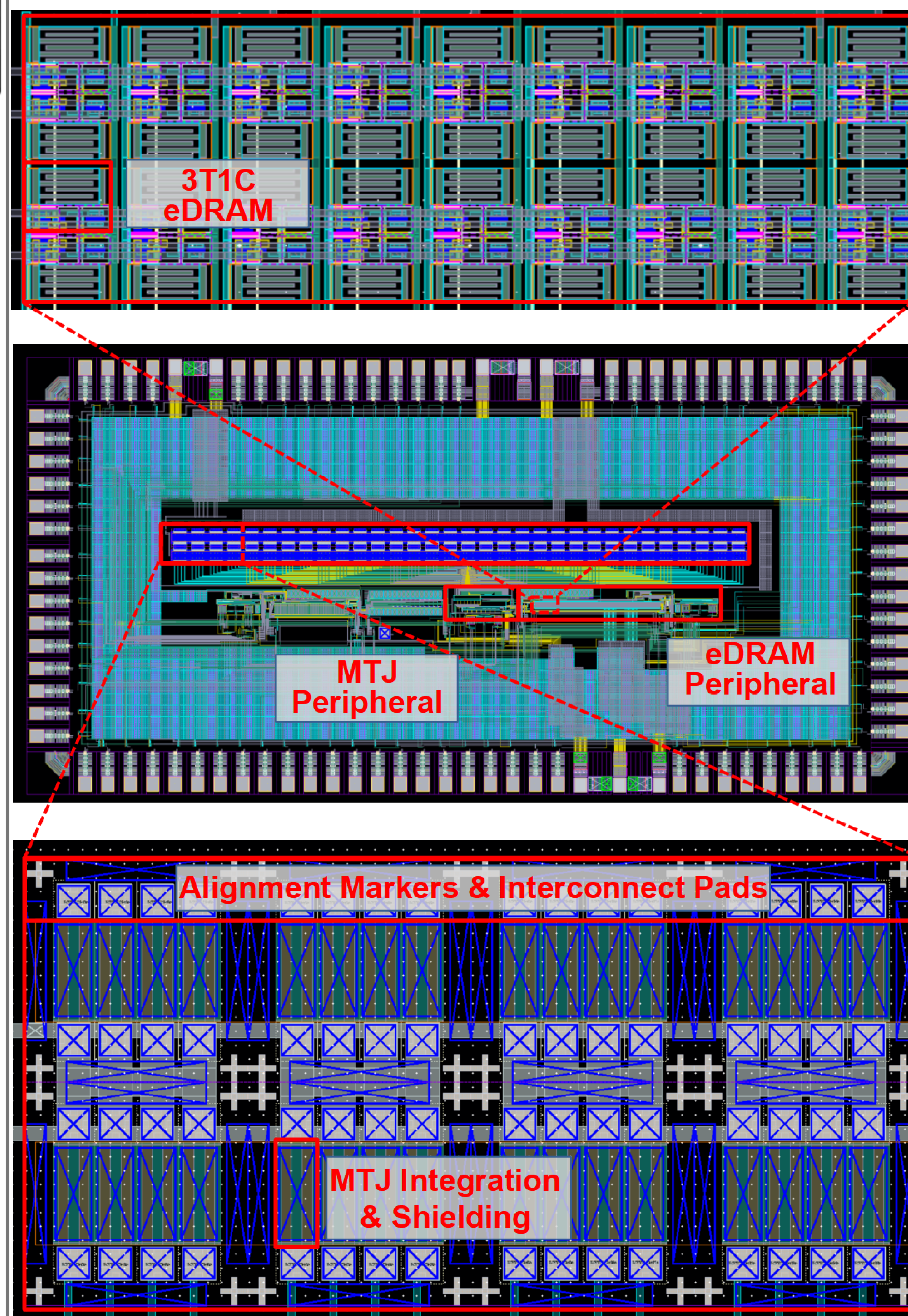
Reference

- [1] N. S. Singh et al., "CMOS Plus Stochastic Nanomagnets Enabling Heterogeneous Computers for Probabilistic Inference and Learning," *Nat. Commun.*, 2024.
- [2] K. Selcuk et al., "DAC-Free p-Bits: Asynchronous Self-Coloring and On-Chip Annealing," *IEDM*, 2025.
- [3] J. Daniel et al., "Experimental Demonstration of an On-Chip p-Bit Core Based on Stochastic Magnetic Tunnel Junctions and 2D MoS₂ Transistors," *Nat. Commun.*, 2024.

p-Bit Characterization & Annealing



Monolithic-3D DAC-less MTJ-CIM Implementation



Acknowledgement

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