

On-the-Fly Machine Learning Model for Future 3D NAND Trim Optimization

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Trim optimization is a pivotal process in NAND flash memory development to meet stringent performance, power, and reliability requirements. Traditionally, this process relies heavily on the expertise and experience of device engineers, demanding significant development time to identify the optimal trim set. As NAND technology progress, the complexity of trim optimization exponentially increases due to the growing number of trim parameters across generations. In this work, we present a novel On-the-Fly Trim Optimization (OFTO) methodology leveraging a Bayesian optimization algorithm to overcome these challenges. Applied to our latest technology BiCS8 node, OFTO enhances performance and reliability by approximately 20% beyond the best results achieved with conventional trim optimization methods. Notably, the trim development cycle is reduced by 80%. This innovative approach represents a significant advancement in streamlining design efficiency for future 3D NAND technologies.