

The Quest for the Ultimate Focused Ion Beam in the Nano-Device Age

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The semiconductor performance scaling or “Moore’s Law” has completely transformed the face of the planet and our daily life in the past half a century. This innovation trend continues through a combination of the transistor density scaling, heterogeneous integration, and architectural breakthroughs. These smaller critical device dimensions, thinner process layers, densely packed structures, complex device routing, and design architecture pose challenges to the focused ion beam (FIB) technology, which is used broadly in the entire product development cycle from the fabrication process to the final product debug and failure analysis. In this paper, we will talk about the unique advantages and applications of alternative ion beam in the areas of circuit edit, failure analysis, fault isolation, yield analysis, and mask repair. Initial results and trade-offs between various beam parameters to enable successful recipe implementation, challenges of the existing technologies, and the requirements for future instrumentation development will be discussed.