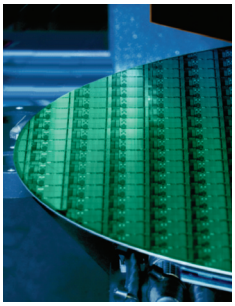
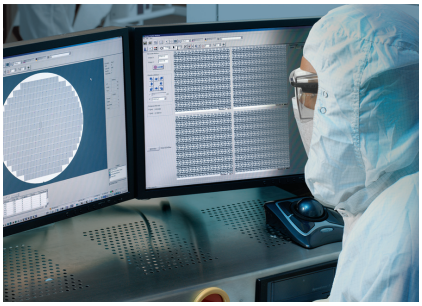
KLA-Tencor
Accelerating Yield





DEFECT INSPECTION

Design Data Improves Narrowband Inspection Results

Context-based inspection is a growing area of innovation which utilizes process, tool or design information to improve defect inspection results or enable novel inspection use cases. In particular, a design-based approach shows potential for producing a more actionable defect Pareto by increasing the representation of critical defects in the review sample; for enhancing sensitivity to suspected design hot spots; and for improving excursion control for both systematic and random defects. In this article we explore the use of design information for customizing the die's inspection care areas, with the goals of increasing defect capture and yield relevance.

Constructed in the inspector's recipe, care areas designate the die areas that will be inspected. Care areas can be grouped according to similar pattern features (dense vs. sparse) or similar device functionalities (memory vs. periphery). Each care area group can be assigned different inspection parameters, such as detection threshold and noise filters, to enable maximum defect capture with minimum false counts across all inspected regions of the die. If care areas encompass mainly yield-critical regions, the inspector will generate a defect Pareto strongly biased toward defects of interest.

For complicated device layouts, engineers often lack the time necessary to manually map out intricate care areas, as the inspection systems are needed for their primary job: defect inspection. Consequently, defect capture in critical die areas may be compromised, and the defect Pareto may be overpopulated with defects of lower yield relevance.

Using design information to help generate an optimal set of care areas can improve this situation. The layout information stored in a GDS II design file can be converted into a set of care areas which are imported into the inspection recipe and automatically aligned to user-defined structures.

The use of design data enables the construction of care areas for thousands of complicated, non-repetitive structures within the die -- a task which would be nearly impossible to replicate using manual methods.

The benefits of using GDS-based care areas include:

- Fully optimized defect capture in every care area of the die
- Minimum false counts across the die
- The ability to combine many small, noisy areas into a "don't care area" group, effectively eliminating these areas from inspection
- The binning of defects based on pattern background, allowing engineers to determine which defects are dominant in each pattern area, and separate defects in critical design areas from defects in low-interest design areas

The resulting "actionable" defect Pareto enables accelerated identification of defect sources, more effective excursion identification, and faster prioritization of yield issues.

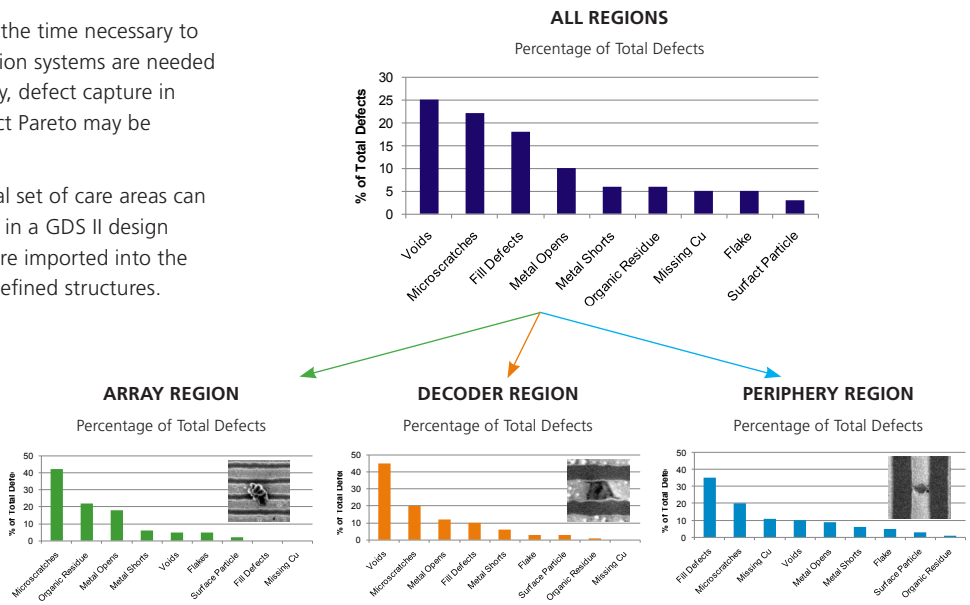


Figure 1. The Puma's design-based care area application, GDS2CA, enables region based defect binning. Results from a CuCMP layer show that different defect types dominate each regional Pareto.