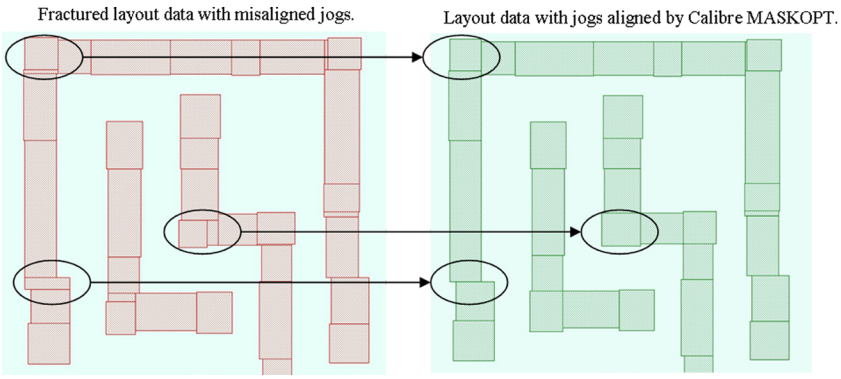
Calibre MASKOPT



Calibre MASKOPT reduces shot counts in post-OPC mask data to decrease mask writing time for variable-shaped beam (VSB) mask writing machines. The left image shows fracturing of OPC data before using MASKOPT, the figure on the right is the simplified fracturing achieved after jog alignment and reduction with MASKOPT.

Advanced Mask Data Optimization

With each technology node, there has been a steady shrink in feature sizes, leading to more complex, model-based optical proximity correction (OPC), more highly fractured mask data that can include misaligned jogs. Each misaligned jog requires a separate "shot" by the VSB mask writer, which increases mask write time and overall mask costs. The close proximity of features and excessive jogs in the data also make mask inspection more difficult.

Calibre MASKOPT reduces mask cost and writing time by lowering the total shot count through advanced pre-processing of the fractured data. Calibre MASKOPT is used after the main OPC layout adjustments and after mask sizing operations to align jogs in the data prior to fracturing. The output from MASKOPT can be verified with Calibre OPCverify and Calibre MDPverify.

Calibre MASKOPT can achieve up to 20% shot count reduction on data sets for advanced technology nodes at 45 nm and below. Reduction of shot count also significantly reduces the file size of the final mask data.

Reducing Mask Shots

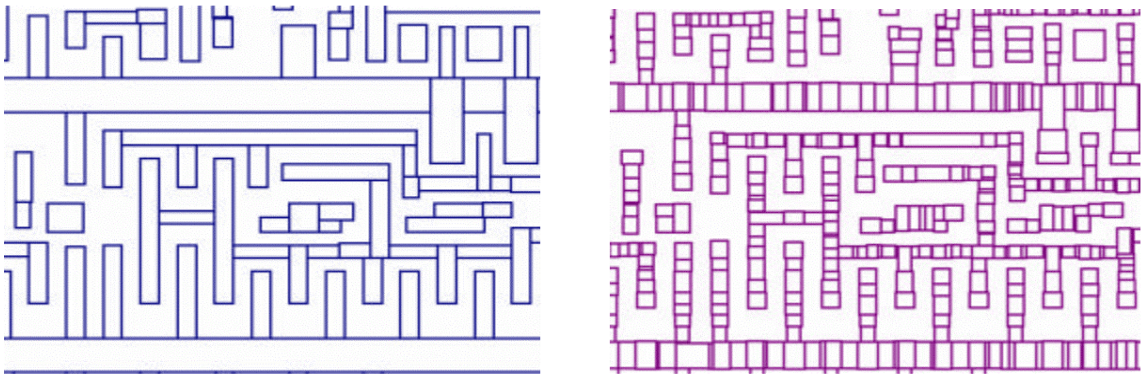
Layout adjustments made for model-based OPC create an enormous number of fractured, moveable segments. Fracturing is the process by which layout polygon data is converted from GDSII or OASIS format to a data format recognized by the mask writer.

Key Benefits

- Simplify and reduce the volume of post-OPC data with no reduction in mask quality
- Reduce shot count by up to 20% on data sets at 45nm and below
- Reduce small figure count by up to 50%
- Reduce mask writing time
- Lower mask writing cost
- Reduce mask data volume
- Improve productivity with integrated mask data preparation flow

Major Product Features

- Removes excessive jogs in post-OPC mask data
- Includes translators for all popular mask writers
- Accepts GDSII and Oasis input data
- Fully integrated with the Calibre tool suite



Calibre MASKOPT addresses the problems that come with highly fractured post-OPC data. The image on the left is the layout before OPC and fracturing. The image on the right shows the fractured data that can impact the mask write time and mask costs.

Calibre MASKOPT aligns excessive jogs in this post-OPC data with no impact on the quality of results with respect to critical dimension (CD) control of the lithography process. Proper alignment of two opposing, misaligned jogs can eliminate one post-fracture rectangle. Over the entire layout, this alignment greatly simplifies post-OPC data, significantly reducing the data volumn, fracture runtime, and mask writing time.

The impact of MASKOPT jog alignment is most significant for layers with extended 2D content and complex OPC─for example, the first metal layer.

Calibre MASKOPT Usability

As part of the Calibre Design-to-Silicon platform, Calibre MASKOPT runs on the fully integrated Calibre hierarchical geometry engine, enabling an integrated mask data preparation flow. It is easy to use and fits easily into existing flows.

With Calibre MASKOPT, mask, OPC, and tapeout engineers can use the same familiar Calibre toolset to build a flow that performs correction and fracturing at the same time, resulting in faster turnaround. The family of Calibre MDP tools and formatting capabilities include:

FRACTUREm (MEBES)

FRACTUREj (JEOL)

FRACTUREt (Toshiba/NuFlare)

FRACTUREh (Hitachi)

FRACTUREc (Micronic)

FRACTUREv

MPCpro

MDPverify

MDPview

nmMPC

Visit our website at www.mentor.com

Copyright © 2009 Mentor Graphics Corporation. Mentor products and processes are registered trademarks of Mentor Graphics Corporation.
All other trademarks mentioned in this document are trademarks of their respective owners.

Corporate Headquarters
Mentor Graphics Corporation
8005 S.W. Boeckman Road
Wilsonville, Oregon 97070-7777
Phone: 503-685-7000
Fax: 503-685-1204

Sales and Product Information
Phone: 800-547-3000

Silicon Valley
Mentor Graphics Corporation
1001 Ridder Park Drive
San Jose, California 95131 USA
Phone: 408-436-1500
Fax: 408-436-1501

North American Support Center
Phone: 800-547-4303

Europe
Mentor Graphics Deutschland GmbH
Arnulfstrasse 201
80634 Munich
Germany
Phone: +49.89.57096.0
Fax: +49.89.57096.400

Pacific Rim
Mentor Graphics Taiwan
Room 1001, 10F,
International Trade Building
No. 333, Section 1, Keelung Road
Taipei, Taiwan, ROC
Phone: 886-2-87252000
Fax: 886-2-27576027

Japan
Mentor Graphics Japan Co., Ltd.
Gotenyama Garden
7-35, Kita-Shinagawa 4-chome
Shinagawa-Ku, Tokyo 140 -0001
Japan
Phone: 81-3-5488-3033
Fax: 81-3-5488-3004

5-09-MGC 1026950-w