

NxMRC – Mask Rule Checker for Semiconductor Photomask

NxMRC is software to perform rule checks on Photomask data to ensure manufacturability of Photomask before actual manufacturing.

Due to aggressive RET and OPC techniques employed at sub-32nm node, the complexity of the patterns on the mask has increased significantly. The increase in the complexity of the patterns demands accurate and efficient Mask Rule Check software to analyze the manufacturability issues with the photomask. Correct identification of the errors on the mask data before manufacturing is critical to maintain mask yield and also reduce the turn around time of the Mask manufacturing and Inspection process.

NxMRC is extremely powerful and flexible software that can handle a variety of mask and layout formats and perform the rule checks on the polygonal and fractured data. NxMRC is developed based on the SoftJin's widely deployed Nirmaan Polygonal Data Processing Platform with the industry's fastest data import and export capabilities. NxMRC supports all major industry formats such as GDSII, OASIS, MEBES, JEOL, OASIS.MASK, VSB-11 and VSB-12. NxMRC is distributed computing enabled and makes use of the current multi-core and the distributed environments for better throughput.

Key Benefits

Excellent Throughput

- Extremely fast in finding MRC violations
- Leverages distributed computing as well as multi core infrastructure
- Unlimited data handling capacity

User friendly Interface

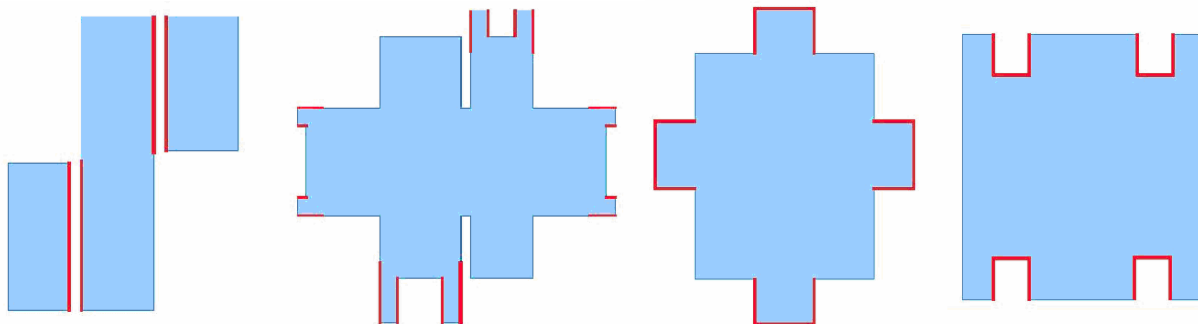
- User friendly TCL interface
- Violation results in a GDSII / OASIS file along with the original input data enabling the user to view the violations in any standard layout data viewer

Improves Mask yield

Reduces TAT of Mask Manufacturing and Mask Inspection

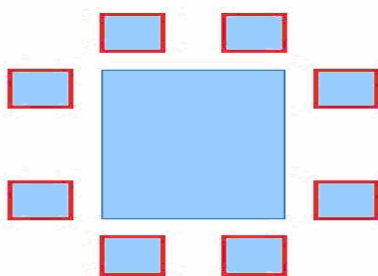
Excellent price to performance ratio

Violations detected by NxMRC (Violations highlighted in Red color)

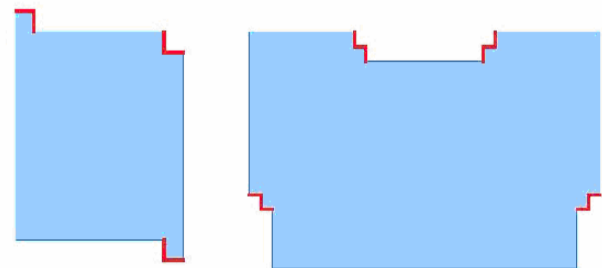


Space and Width Rule Checks

Jog and Notch Rule Checks



Minimum Area Check



Double and Triple Short segment Check

Key Product Features

■ Inter-polygonal Rule Checks

- **Space Check** to check the spacing violations between two shapes
- **Singularity Check** to check if any vertex of a shape is shared with any other shape. Singularity check ensures that none of the shapes on the mask are touching each other at a vertex.

■ Intra-polygonal Rule Checks

- **Width Check** to ensure that all patterns of the mask meet the minimum width requirement
- **Jog Check** to detect jogs of less than the specified dimension
- **Notch Check** to find notches of less than the specified dimension
- **Double Short Segment Check** to find the two consecutive segments of a de-fractured polygon whose lengths are less than the specified value. Double short segments result into unavoidable slivers.
- **Triple Short Segment Check** to find the three consecutive segments of a de-fractured polygon whose lengths are less than the specified value. Triple short segments results into unavoidable slivers.
- **Angle Check** to find if any of the segments of a polygon intersect at an angle less than the specified value
- **All Angle Check** to find the segments at an angle which is not a multiple of 45°
- **Area Check** to find the shapes whose area is less than the specified value

■ Grid Point Check

- **Grid point check** to find the vertices of the shapes that are not aligned to the user specified grid point

■ Violation Report

- Violations are reported in the form of GDSII / OASIS file with the violations highlighted along with the original Input data

■ Distributed computing and multi-core support

- Efficient use of distributed processing and multi-core architecture for better throughput

- Intelligent partitioning and distribution of data across multiple cores and multiple CPUs
- Customizable attributes in the user parameter file enabling user to control the distributed environment

■ Large Data Handling

- Unlimited data handling capacity, capable of handling files of any size
- Efficient and versatile geometric engine to support all-angle as well as positive and reverse tone data

■ Supports Mask formats and Jobdecks

- **Input Mask formats** - MEBES, VSB-11, VSB-12, JEOL, OASIS.MASK and MIC
- **Input Mask Jobdeck formats** - MEBES, VSB-11, VSB-12, JEOL, and MALY
- **Input Layout formats** - GDSII and OASIS

■ Advanced operations on Input layout data

- Built in Boolean functions on the input data layers of the layout file
- Layer specific option to filter out the input layers for Rule Checks in the layout file
- Supports positive and reverse tone data
- Scaling, Rotation, Translation, Mirroring and Tone reversal operations on the input layers

■ Query operations on the input data

- Query functions on the input data to run the Rule Checks on a subset of data
- Full chip, Window-specific, and Cell-specific, and options to filter out the input data for Rule Checks

■ User Friendly Interface

- TCL based user scripting interface enables easy customization, configuration and integration
- As part of SoftJin's NxMDP tool-suite, NxMRC has close integration with other tools including NxFracture(Fracturing layout data to mask data), NxCompare (for layout / mask data equivalence check and other Boolean / geometrical operations), and NxStats (for analyzing QoR related statistics from mask data)

■ Backed by SoftJin's proven customized software development and integration services to meet specific needs and customizations for OEMs and end-customer

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About SoftJin

SoftJin Technologies develops Innovative and Customized Automation software for Electronic Design and Manufacturing. SoftJin offers several Software Products that address the challenges associated with IC Manufacturing at advanced process nodes including Post Layout Analysis, Optimizations and Mask Data Preparation. SoftJin's software products also serve as embedded components, Analysis and productivity enhancement tools for Lithography and Inspection equipments. See more details at www.softjin.com