

CADENCE LITHO PHYSICAL ANALYZER

Full-Chip, Model-Based Design Manufacturability Checking and Contour Shape Prediction

A comprehensive model-based design manufacturability checker, Cadence® Litho Physical Analyzer detects manufacturability issues missed by traditional DRC check in a fraction of the time required by solutions based on OPC and lithography simulation. Silicon-proven and foundry-endorsed, it quickly and accurately accounts for systematic manufacturing variations on all critical layers, helping designers improve yield during physical design implementation.

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At 65 nanometers and below, lithography, etch, and mask systematic manufacturing variations surpass random variations as the prime limiters to catastrophic and parametric yield loss. The interaction of manufacturing shapes within the optical proximity halo and the spatially partially-coherent lithography projection systems creates highly non-linear systematic variations at different process conditions that cannot be captured by rules or pattern matching. These systematic shape variations, dependent on specific layout shape context, result in predictable catastrophic errors such as necking (opens) and bridging (shorts). Furthermore, the litho-induced systematic shape variations of interconnect and gate have a non-linear impact on electrical parameters such as timing, leakage power, and signal integrity.

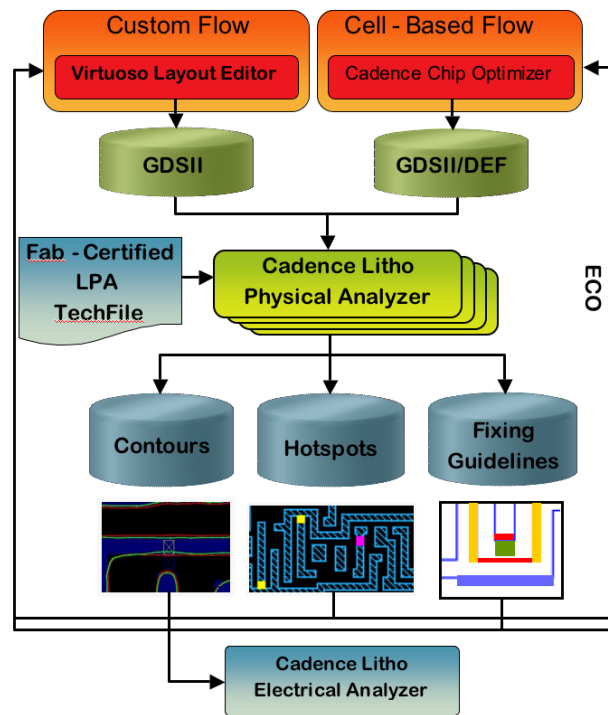


Figure 1: Cadence Litho Physical Analyzer use model

Cadence Litho Physical Analyzer helps designers solve these systematic design-for-manufacturing (DFM) challenges. It is a full-chip, model-based design manufacturability checker that designers can use to detect lithography hotspots based on fast and accurate silicon contour prediction across the process window. It creates fixing guidelines to help designers or design tools correct these hotspots. These predicted silicon contours can be used for further electrical DFM analysis with Cadence Litho Electrical Analyzer, enabling designers to improve parametric yield and chip performance by accurately determining the impact of systematic manufacturing variations during design.

BENEFITS

- Detects yield-limiting variability hotspots based on foundry-certified technology files
- Helps designers improve printability and yield with fixing guidelines
- Checks cells in seconds / full chips in hours with proprietary formulation that allows fast and accurate silicon contour prediction across the process window
- Integrates with most commonly used design flows
- Offers fast runtimes and a designer-friendly use model
- Compatible with existing design farms for easy adoption by design teams
- Integrates with Cadence Litho Electrical Analyzer

FEATURES

MODEL-BASED MANUFACTURING SHAPE PREDICTION

Traditional approaches to deal with manufacturing variations are no longer adequate. Design rule checking (DRC) alone does not prevent catastrophic yield loss due to systematic shape variations; additionally, DRC rules to address growing DFM issues become prohibitive in number and complexity. Post-GDSII OPC uncovers printability problems that frequently

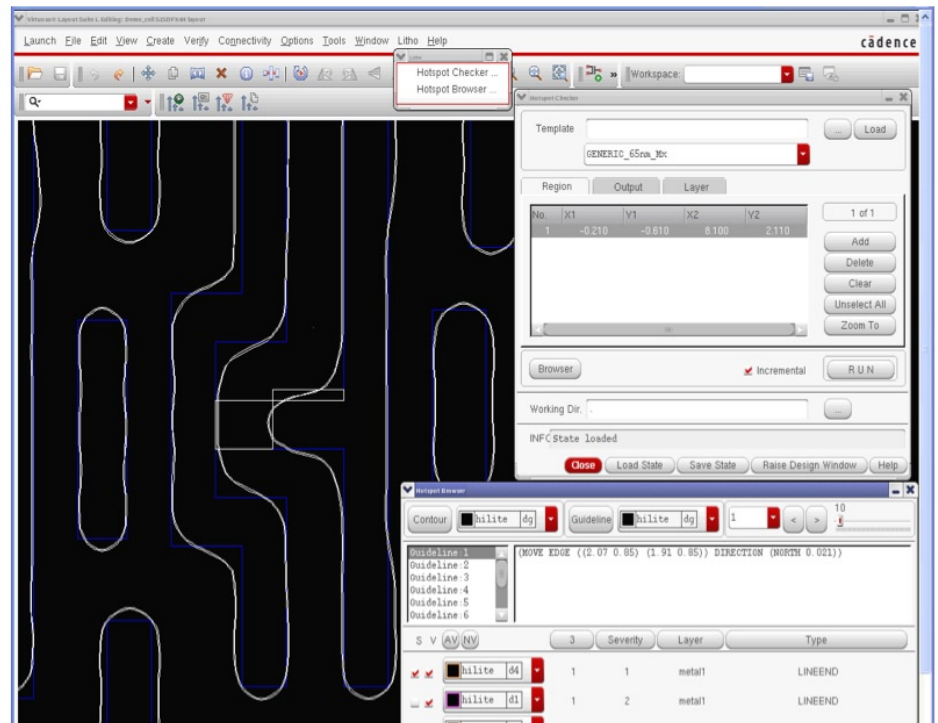


Figure 2: Litho Physical Analyzer hotspot browser Layout Editor

require actual design changes when there is limited freedom after tapeout, making design closure unpredictable. Running post-GDSII OPC tools during layout is not feasible, because it takes days for every layer to run a typical design through OPC.

Designers can restrict their design style in an attempt to improve yield, but this method limits the use of leading-edge processes that optimize area and performance. Only model-based predictive approaches (that are not based on moving post-GDSII OPC tools to the designer's desk) are fast enough to let designers uncover hotspots during design implementation and make real-time design adjustments to eliminate them.

Cadence Litho Physical Analyzer is a full-chip, model-based design manufacturability checker—silicon-proven and endorsed by all major foundry platforms—that designers can use to find and fix hotspots and predict contours across process conditions. It uses a patent-pending, model-based, non-linear optical transformation algorithm that allows designers to quickly and accurately detect

potential manufacturing failures during physical design that would otherwise be found after tapeout in mask or silicon. The compact models encapsulate all necessary RET, OPC, mask, etch, and lithography effects on both device and interconnect, and predict accurate contours for the entire chip from drawn layout in a matter of hours. Cadence Litho Physical Analyzer is typically an order of magnitude faster than other model-based tools.

SOPHISTICATED HOTSPOT DETECTION AND CORRECTION GUIDELINES

Litho Physical Analyzer identifies hotspots based on fab-designated criteria or litho yield sensitivity (LYS) metrics. It sorts hotspots by type and criticality, and pre-checked blocks can be excluded by name, area, or marker layer. The non-linear optical transformation algorithm also allows generation of automatic fixing guidelines that are input into the user's choice of physical design tools, such as Cadence Virtuoso® Layout Suite and

Cadence Chip Optimizer. Litho Physical Analyzer integrates with current library, IP, custom analog, and cell-based digital physical design flows.

DESIGNER FRIENDLY

With a usage model similar to DRC, Litho Physical Analyzer works from layout and fab technology file input to produce a full-chip report that flags DFM hotspots such as opens and shorts, contact coverage, gate variability, and line-end pullback in the original layout. It also provides engineering change order (ECO) guidelines. Litho Physical Analyzer guides designers to make changes only when there is a problem due to process-design interaction. The results and recommendations can be easily exported to most layout editors and/or place-and-route tools.

Litho Physical Analyzer provides an interface to Virtuoso Layout Editor, enabling designers to browse hotspots and guidelines and perform incremental check directly from the layout window. For cell-based designers, Cadence Chip Optimizer uses Litho Physical Analyzer's hotspot and guideline results to automatically correct hotspots while maintaining timing and DRC.

COMPREHENSIVE FOUNDRY SUPPORT

Litho Physical Analyzer's unique formulation, which makes it accurate and OPC-tool independent, eases and speeds its adoption by all major foundry platforms and IDMs. Litho Physical Analyzer is used by major foundries and their customers to systematically detect hotspots on designs prior to manufacturing.

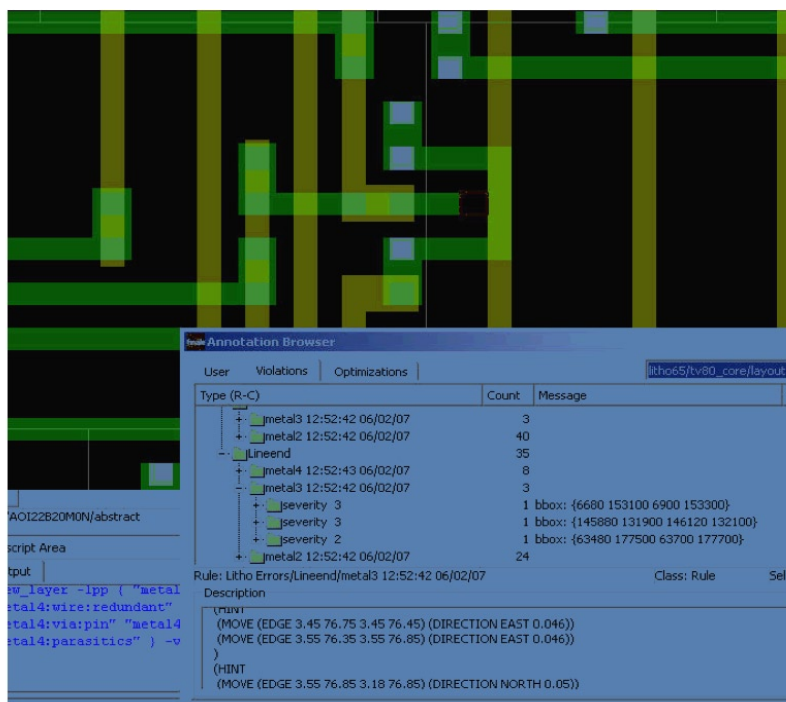


Figure 3: Litho Physical hotspot browser in Cadence Chip Optimizer

SPECIFICATIONS

FOUNDRY SUPPORT

- Certified and supported by leading foundries and IDMs
- Flow-tested and qualified with foundry DFM data kits (DDKs)

FORMAT SUPPORT


- Design input: GDSII, LEF/DEF
- Design output: GDS, HIF, DLD (contour database for Cadence Litho Electrical Analyzer)

PLATFORMS

- Linux (32-bit, 64-bit)

CADENCE SERVICES AND SUPPORT

- Cadence application engineers can answer your technical questions by telephone, email, or Internet—they can also provide technical assistance and custom training
- Cadence certified instructors teach more than 70 courses and bring their real-world experience into the classroom
- More than 25 Internet Learning Series (ILS) online courses allow you the flexibility of training at your own computer via the Internet
- SourceLink® online customer support gives you answers to your technical questions—24 hours a day, 7 days a week—including the latest in quarterly software rollups, product change release information, technical documentation, solutions, software updates, and more



For more information,
Email us at

info@cadence.com

or visit

www.cadence.com



cadence™

Cadence Design Systems, Inc.

CORPORATE HEADQUARTERS

2655 Seely Avenue

San Jose, CA 95134

P: +1.800.746.6223 (*within US*)

+1.408.943.1234 (*outside US*)

F: +1.408.943.5001

www.cadence.com