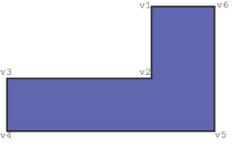
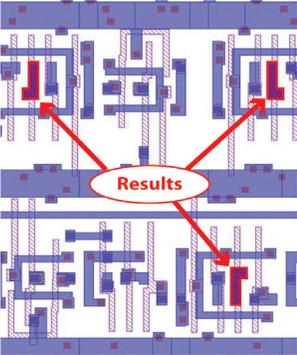


Calibre Pattern Matching

Classic DRC	Pattern Matching	Results
<pre>// Rules for simple "L" shape Begin Detection Locate all edges on M1 that are 0.66 um in length with 2 convex endpoints Expand the edge inwards by 0.01 um to create a new polygon Capture all overlaps between the newly created layer polygons and the original M1 layer polygons Locate all edges on all overlapp... 1.75 um in length with 2 convex endpoints Expand the edge inwards by 0.01 um to create a new polygon Capture all overlaps between the newly created layer polygons and the original M1 layer polygons Locate all edges on all overlapp... 1.27 um in length with 2 convex endpoints Expand the edge inwards by 0.01 um to create a new polygon Capture all overlaps between the newly created layer polygons and the original M1 layer polygons Locate all edges on all overlapp... 0.26 um in length with 2 convex endpoints Expand the edge inwards by 0.01 um to create a new polygon Capture all overlaps between the newly created layer polygons and the original M1 layer polygons Find the polygonal intersections of the first and second overlap captures Find the polygonal intersections of the third and fourth overlap captures Find the polygonal intersections of the previous two intersection layers // Q.E.D. End Rulecheck</pre>	<p>Import Pattern Definition Run Calibre Pattern Matching</p> 	

Traditional scripting
requires many lines
of code for even the
simplest shapes,
regardless of the
scripting language used.

Calibre automated pattern matching significantly reduces rule deck size while improving the accuracy and precision of design implementation and verification.

At 45 nm and below, design constraints have become a complex, interdependent, multi-dimensional set of variables. Lithography restrictions and physical manufacturing limitations create an ever-expanding set of design requirements, leading to an explosion in rule deck size and complexity. Where simple one-dimensional checks were once sufficient, multi-dimensional checks that examine the inter-relationship of multiple geometries over long ranges are now essential to ensure manufacturability. Even at mature design nodes like 90 nm and above, AMS and RF applications often have design considerations that are difficult to implement in text-based design rules. This upsurge in complexity means many desired advanced DRC checks are difficult (if not nearly impossible) to accurately code. The increase in deck size and complexity also results in increased verification runtimes and longer debug times.

Calibre Pattern Matching

Calibre Pattern Matching provides interactive and automated pattern capture, definition, and search that can be used across implementation, verification, and test flows. Pattern matching replaces complex and lengthy text-based design rule checks containing 10s to 100s of operations with a visual geometry that provides a precise and accurate point of congruence between the original intent of the design specification and its implementation as a design rule check.

The simplicity of capturing extremely complex geometric relationships with Calibre Pattern Matching enables the creation of advanced physical verification (PV) or design methodology checks that were previously difficult or operationally impossible to create—enabling designers to deliver higher-performing products with reduced design variability.

As a part of the Calibre nm Platform, Calibre Pattern Matching can be used with a range of different Mentor products. Calibre nmDRC and Calibre Pattern Matching can work together within a single PV sign-off deck. Olympus SoC, Calibre

Key Product Features

- **Automated pattern capture** via a familiar GUI or batch scripting environment.
- **Specify exact matches or controlled variability.**
- **Use with multiple Calibre tools** as part of one SVRF deck.
- **Invoke through all existing Calibre integrations** with other design environments.
- **Same report style** as Calibre nmDRC and Calibre LFD.

Key Product Benefits

- **Reduces design variability** by enabling PV checks that were impractical or impossible with text-based scripting.
- **Significantly reduces rule deck size** by replacing complex text-based rules with a single visual geometry definition.
- **Provides unambiguous, direct communication between teams** with system that is easy to use and integrate with existing tools.
- **Improves productivity of rule deck developers** by eliminating use of scripting language to interpret complex engineering specifications.
- **Integrated with Olympus SoC and Calibre InRoute** to enable pattern-matching-driven implementation with auto-fixing and verification.
- **Integrated with Calibre products** to enable pattern-matching-driven analysis and verification.

InRoute and Calibre Pattern Matching are integrated to provide pattern matching-driven place and route with auto-fixing. Design teams that do not use Olympus-SoC can invoke Calibre nmDRC/Calibre Pattern Matching from another P&R or design tool. Results can be debugged using the same process and design environment you currently use to debug Calibre nmDRC results.

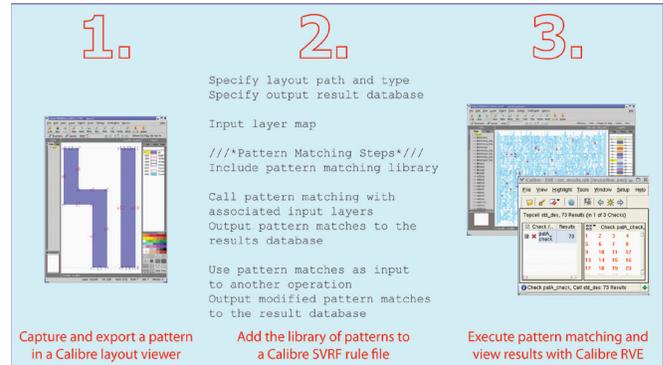
Calibre nmDRC's integrations with all major design creation environments means you can run Calibre Pattern Matching anywhere you run Calibre nmDRC. Combining Calibre's breadth of integrations with the simplicity of pattern creation makes Calibre Pattern Matching a game changer for streamlining communication from manufacturing and design methodology teams to design implementation and verification groups. Faster, more accurate communication using actual patterns (rather than text-based abstractions) also makes the entire implementation and verification process faster and more efficient. Now teams can receive accurate, quick updates for recently found yield-limiting patterns with a level of simplicity not possible with traditional flows.

Pattern Identification and Definition

Pattern creation is easy with Calibre Pattern Matching. Designers can choose to draw a pattern manually (using Calibre DESIGNrev or Calibre Workbench), then specify an exact match or controlled pattern variability. Alternatively, using error markers from a prior Calibre nmDRC/LFD run, designers can use Calibre Pattern Matching's automated flow to capture hundreds or thousands of patterns all in one step.

Pattern Detection

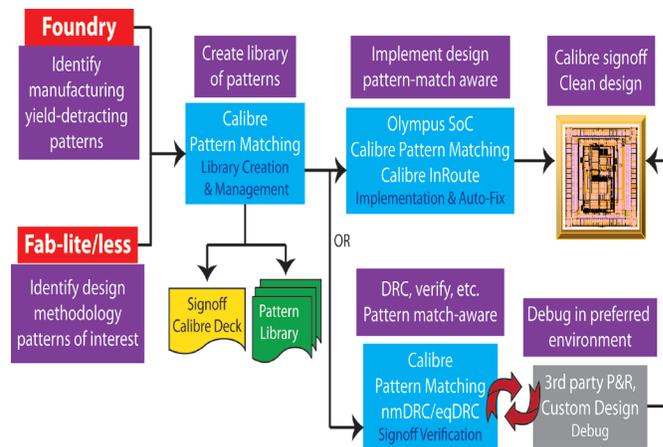
When invoked, the pattern matching engine scans the design to find matches. A marker is placed at the site of every pattern match. Flexible marker definitions enable the use of different markers for different layers, and provide for user-defined markers appropriate to a specific process (e.g., markers used for DRC runs can be defined to look like regular DRC results, and can be debugged in exactly the same way). Because pattern matching is a direct visual comparison between actual geometries, accuracy and precision are increased, and debugging is greatly simplified.



Using Calibre Pattern Matching in physical verification and design implementation is as easy as 1-2-3.

Calibre nm Platform Integration

The Calibre nm platform, the industry's leading physical verification platform, is known for delivering best-in-class performance, accuracy, and reliability. A powerful hierarchical engine is at the heart of the Calibre tool suite. Calibre Pattern Matching is built on and integrated into the Calibre platform, so it can be used with regular Calibre rule decks and process flows. No stream-outs/stream-ins or complicated scripts are needed to incorporate Calibre Pattern Matching into your implementation or PV flows. This direct integration enhances performance and reduces turnaround times for even the most complex and advanced designs, without the need for time-consuming or convoluted auxiliary processes.



The same sign-off Calibre nmDRC rule deck and pattern library can be used as input into Olympus-SoC and Calibre InRoute/Pattern Matching/nmDRC. In this flow, Calibre Pattern Matching is used to catch yield-detractor routing errors (identified in the pattern library) and output a clean design.

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06-2010

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