Silicon Lifecycle Management Family
Improving silicon health and operational metrics at each phase of the system lifecycle

www.synopsys.com/slm
Synopsys SLM Family

The Synopsys SLM family is designed to improve silicon health and operational metrics at every phase of the system lifecycle. SLM is built on a foundation of in-chip IP, data analytics and design automation. Environmental, structural and functional monitors enable deep insights from SoC manufacturing to In-Field systems. Meaningful data is gathered at every opportunity for continuous analysis and actionable feedback. SLM fully leverages Synopsys’ solutions for design automation.

Actionable Insights Through Silicon Lifecycle Monitoring and Analytics

Vision

Silicon Lifecycle Management (SLM) is an essential aspect of any advanced SoC based system today. Optimal silicon cost, quality, health and performance can only be achieved through continuous in-chip monitoring and analytics.
SLM IP

The Synopsys SLM family is built on a foundation of monitor IP. They are classified as: environmental, structural and functional monitors. They gather relevant data throughout the silicon lifecycle.

**PVT Monitors**

Process, Voltage and Temperature (PVT) monitoring is critical for optimal operation and performance in today’s SoCs

- Maximizes performance, power, reliability
- Highly accurate, distributed monitoring throughout the die
- Available on process nodes from 28nm to 3nm

**Path Margin Monitors**

Measure timing margin of actual functional paths in-test and in-field

- Monitor 1000+ synthetic and functional paths
- Optimize silicon performance based on actual margins available
- Automated path selection, IP insertion, and scan generation

**Clock and Delay Monitors**

Measure delay between edges of a signal(s)

- Clock duty cycle quality check
- Memory access time tracking with BIST
- Digital delay line test characterization

**UCle Monitor, Test & Repair**

Comprehensive UCle SLM solution

- Monitor signal quality on D2D UCle lane(s)
- Logic BIST with near and far end modes
- Repair lanes with redundancy allocation In-Field

**High Speed Access & Test**

Enable testing over functional interface (PCle, USB, SPI, …)

- Used during In-Field operation as well as WS, FT, SLT
- Supported by instruments from leading ATE providers
- Reduced pin count & test hardware saves cost
SLM Production Analytics

Silicon.da is a unified analytics solution that covers all product manufacturing phases, and provides the ability to analyze petabytes of silicon and system data. It automatically highlights silicon data outliers, enabling engineering teams to quickly identify and correct underlying issues in the semiconductor supply chain.

With Silicon.da, engineering teams can leverage silicon design, monitor, diagnostic, fab and production test data to improve key chip production metrics such as quality, yield and throughput, as well as key silicon operational metrics such as chip power and performance.

![Graphs showing productivity, efficiency, and scalability]

- Actionable insights out-of-the-box
- Automated root cause analysis
- Accurate FA candidate selection

Efficiency

- Power and performance optimization
- Quality, yield, throughput optimization
- Real-time production control

Scalability

- Petabytes of data
- Multi domain support
- Cloud enabled

SLM In-Field Analytics

Once a device is deployed into the field it is essential that it is continually monitored, tested, analyzed and potentially adapted. On-chip or cloud-based analytics can be used for predictive maintenance, aging identification, and fault detection in order to mitigate the risk of catastrophic system failures.

Monitor data can also enable real-time analytics and optimization schemes, such as Adaptive Voltage Scaling (AVS) resulting in lower power and extend device lifetime.

Finally, cloud-based analysis of data from design, manufacturing and in-field provides powerful insights into the health of a fleet of devices, enabling better informed decisions to address root cause analysis for traceability and RMAs.

SLM & Test Synergy

Synopsys SLM and Synopsys TestMAX™ solutions encompass integrated tools, IP and methodologies to test, monitor and analyze SoCs, providing actionable insights at every phase of the device lifecycle.

These innovative test and analytics tools enable a unified flow that is securely connected to Synopsys’ Fusion Design Platform for deep insights, from in-design to in-field, meeting design, test, and operational goals concurrently for the entire lifespan of a silicon device.
SLM Use Cases

Below is a selection of some of the popular SLM customer use cases:

- **Vmin Optimization**
  - Monitor driven Vmin optimization

- **Adaptive Voltage Scaling**
  - Dynamically adjust supply voltage

- **Silicon Model Correlation**
  - Improved design optimization flow

- **Process Classification**
  - Accurate binning & debug

- **Mission Profile Analytics**
  - Insights into in-field operation

- **Predictive Maintenance**
  - Avoid wear-out failures

**SLM Established Tool Solutions**

The Synopsys Silicon Lifecycle Management Family includes multiple integrated products and capabilities. The key components of SLM are highlighted below:

**SYNOPSYS SILICON LIFECYCLE MANAGEMENT FAMILY**

<table>
<thead>
<tr>
<th>Product Analytics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design Calibration Analytics</strong></td>
</tr>
<tr>
<td>Digital Design Family</td>
</tr>
<tr>
<td><strong>Design, Ramp and Production Analytics</strong></td>
</tr>
<tr>
<td>Silicon.da</td>
</tr>
<tr>
<td><strong>Die Level and Package/PCB Failure Analysis</strong></td>
</tr>
<tr>
<td>Avalon &amp; SysNav</td>
</tr>
<tr>
<td><strong>In-Field Management Optimizer</strong></td>
</tr>
</tbody>
</table>

- **Unified Database**
- **Embedded Analytics & Optimization**
  - ATE High-Speed Access & Test
  - Chip
  - System
- **Silicon Monitors**
  - Environmental PVT Monitors
  - Structural Path Margin Monitors XLBIST
  - Functional Clock & Delay Monitor UCIe Monitor, Test & Repair

For additional information on Synopsys Silicon Lifecycle Management and Synopsys TestMAX solutions, please visit our website or contact us.