



## Keysight, Synopsys, and Ansys Accelerate RFIC Semiconductor Design with New Reference Flow for TSMC's Most Advanced 4nm RF FinFET Process

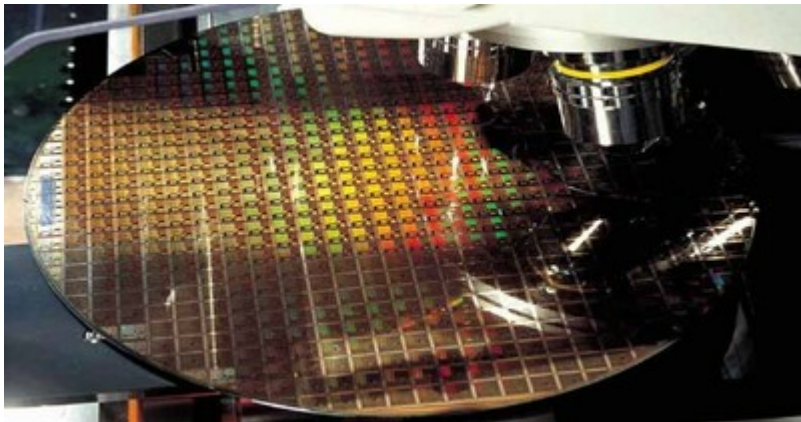
September 27, 2023

**Ansys signoff power integrity and electromagnetic modeling capabilities featured in new custom design flow that meets the needs of high-speed circuit designers**

### / Key Highlights

- New reference flow offers open, efficient radio frequency design solution that supports streamlined migration from previous process nodes
- Industry-leading electromagnetic simulation tools boost 5G/6G wireless system on a chip performance and power efficiency
- Integrated flow improves designer productivity, increases simulation accuracy for faster time-to-market

PITTSBURGH, Sept. 27, 2023 /PRNewswire/ -- [Keysight Technologies, Inc.](#) (NYSE: KEYS), [Synopsys, Inc.](#) (Nasdaq: SNPS), and [Ansys](#) (Nasdaq: ANSS) announced a new reference design flow for TSMC N4P RF, the silicon foundry's most advanced 4 nanometer (nm) radio frequency (RF) FinFET process technology. The reference flow is based on the Synopsys Custom Design Family and integrates the Ansys multiphysics platforms, which provides a complete RF design solution for customers seeking an open RF design environment with higher predictive accuracy and productivity. It provides designers with a choice of best-in-class solutions and includes validated integrations with radio frequency integrated circuit (RFIC) design and interactive electromagnetic (EM) analysis tools from Keysight and signoff power integrity and EM modeling from Ansys.



Next-generation wireless systems feature higher bandwidth, more connected devices, lower latency, and broader coverage. Design complexity of RF integrated circuits used for wireless data transmission such as transceivers and RF front-end components continues to grow. Higher circuit frequencies, smaller feature sizes, and complex layout-dependent-effects make high speed design physics challenging, requiring more accurate and comprehensive modeling and simulation to achieve the highest performance and robust product reliability.

The TSMC 4nm RF design reference flow improves design turnaround time and layout productivity in the Synopsys Custom Compiler™ design and layout environment. Reference design flow certification includes rigorous validation of TSMC's 4nm RF process design kit (PDK) using critical design components including sub-6 GHz low noise amplifiers (LNAs) and LC-tuned voltage-controlled oscillators (LC VCOs). The reference flow features industry-leading tools that enable efficient passive device synthesis, EM model extraction, thermal-aware electromigration analysis extended to include device metal, and post-layout extraction with correct handling of circuit under inductor (CUI) structures.

In addition to Synopsys Custom Compiler, the open, modern reference flow incorporates:

Golden signoff accuracy circuit simulation performance from Synopsys PrimeSim™ simulation tools and PrimeSim™ Reliability Environment, and signoff physical verification and extraction solutions from Synopsys IC Validator™ and Synopsys StarRC™.

[Ansys Totem™](#) provides thermal-aware signoff electromigration verification and power integrity analysis (EM/IR). [RaptorX™](#) and [Exalto™](#) provide signoff electromagnetic modeling, with unique CUI features enabling significant area and cost reductions of up to 50%. [VeloceRF™](#) delivers fully automatic silicon layout synthesis for electromagnetic devices including multi-layer inductor spiral, baluns/transformers, and transmission lines to enable the highest circuit performance and accuracy.

Keysight PathWave ADS RFPro provides rapid, interactive EM-circuit co-simulation and analysis to find and fix layout-dependent-effects up front in the development cycle. PathWave RFIC design (GoldenGate) supports harmonic balance simulation in early chip design and verification process.

"Keysight, Synopsys, and Ansys have expanded their strategic technology collaboration with TSMC to deliver the next level in RF design for advanced 4nm RF technology," said Niels Faché, vice president and general manager at Keysight EDA. "We've witnessed RF designers struggling to use older-generation solutions and flows that were never intended for today's 5G/6G system-on-chip and RF subsystem designs. New layout-dependent-effects make detailed simulation and modeling that is signoff accurate a must-have. Other commercial tools and workflows do not always include these

newest foundry requirements, and often lack the capacity to model modern analog designs with hundreds of coupled signal ports."

"Synopsys, Ansys, and Keysight have harnessed decades of expertise in custom analog, RF, and multi-physics design to reduce risk and accelerate success for our mutual customers," said Sanjay Bali, vice president strategy and product management EDA group at Synopsys. "Our latest collaboration with Ansys and Keysight on the new RF design reference flow supporting TSMC's advanced 4nm process node provides an open and optimized flow that delivers exceptional quality-of-results for advanced 5G/6G wireless systems."

"Multiphysics raises novel challenges for our customers to optimize power, area, reliability, and performance as RF frequencies climb into the millimeter wave and sub-THz range," said John Lee, vice president and general manager, electronics, semiconductor, optics business at Ansys. "First-pass customer success depends upon applying best-in-class solutions across the design flow. In partnership with Keysight and Synopsys, Ansys is working closely with TSMC to make our industry-leading power integrity and electromagnetic modeling technology available in a custom design flow that responds to the needs of high-speed circuit designers."

Resources:

- Keysight EDA: <https://www.keysight.com/find/eda-info>
- Synopsys Custom Design Family: <https://www.synopsys.com/implementation-and-signoff/custom-design-platform.html>
- Synopsys RF Design Solution: <https://www.synopsys.com/rf-design.html>
- Ansys Multiphysics Signoff: <https://www.ansys.com/products/semiconductors>

### **/ About Keysight Technologies**

At Keysight (NYSE: KEYS), we inspire and empower innovators to bring world-changing technologies to life. As an S&P 500 company, we're delivering market-leading design, emulation, and test solutions to help engineers develop and deploy faster, with less risk, throughout the entire product lifecycle. We're a global innovation partner enabling customers in communications, industrial automation, aerospace and defense, automotive, semiconductor, and general electronics markets to accelerate innovation to connect and secure the world. Learn more at [Keysight Newsroom](#) and [www.keysight.com](http://www.keysight.com).

### **/ About Synopsys**

Synopsys, Inc. (Nasdaq: SNPS) is the Silicon to Software™ partner for innovative companies developing the electronic products and software applications we rely on every day. As an S&P 500 company, Synopsys has a long history of being a global leader in electronic design automation (EDA) and semiconductor IP and offers the industry's broadest portfolio of application security testing tools and services. Whether you're a system-on-chip (SoC) designer creating advanced semiconductors, or a software developer writing more secure, high-quality code, Synopsys has the solutions needed to deliver innovative products. Learn more at [www.synopsys.com](http://www.synopsys.com).

### **/ About Ansys**

Our Mission: Powering Innovation that Drives Human Advancement

When visionary companies need to know how their world-changing ideas will perform, they close the gap between design and reality with Ansys simulation. For more than 50 years, Ansys software has enabled innovators across industries to push boundaries by using the predictive power of simulation. From sustainable transportation to advanced semiconductors, from satellite systems to life-saving medical devices, the next great leaps in human advancement will be powered by Ansys.

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/ Contacts

Media Mary Kate Joyce 724.820.4368 <a href="mailto:marykate.joyce@ansys.com">marykate.joyce@ansys.com</a>
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Investors Kelsey DeBriyn 724.820.3927 <a href="mailto:kelsey.debriyn@ansys.com">kelsey.debriyn@ansys.com</a>
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