

Laying the foundation for semiconductor industry AI collaboration and development

Llama 3.1 70B-based domain-specific LLM
enhances chip design, manufacturing and testing



At a glance

Aitomatic leverages Llama to create SemiKong, the world's first open-source large language model (LLM) tailored for the semiconductor industry. SemiKong is designed to accelerate AI applications that enhance processes from chip design to manufacturing and beyond.



Industry

Manufacturing



Use case

Optimizing integrated circuit design, manufacturing and testing processes



Goal

Reduce semiconductor and chip development cost and complexity



Llama version

Llama 3.1 70B



Deployment

Designed for both on-premises and cloud platforms

Results*

30%

reduction in
time-to-market for
new chip designs

25%

increase in
first-time-right
chip manufacturing

50%

faster onboarding
for semiconductor
professionals

15%

jump in patent filings
from accelerated
innovation

The challenge

Highly technical and complex semiconductor design and manufacturing

Generative AI demonstrated great potential to enhance mission-critical applications and operations in semiconductor design and manufacturing. However, general-purpose LLMs weren't equipped to effectively handle the industry's complex and highly technical processes. The LLM gap was stifling AI innovation, collaboration and adoption across the semiconductor space.

Make semiconductor AI development less complicated and costly

Aitomatic wanted to create an open-source and highly accessible domain-specific LLM to accelerate AI application development and reduce costs for semiconductor companies. The ultimate aim? To revolutionize semiconductor design and manufacturing processes, reshaping the \$500 billion industry.

AITOMATIC

Aitomatic is transforming the semiconductor industry with its Domain-Expert Agents (DXAs). Through its neurosymbolic AI technology, Aitomatic helps semiconductor companies capture and scale their deep domain expertise to enhance and transform operations.



The solution

The world's first open-source semiconductor industry LLM, built on Llama

In collaboration with members of the AI Alliance, Aitomatic developed SemiKong, the world's first open-source LLM designed specifically for the semiconductor industry. Using Llama 3.1 70B as its base, SemiKong delivers a specialized foundation to jumpstart AI solution development for everything from chip design and manufacturing to research and development and technical documentation.

Llama's open-source nature aligned with Aitomatic's goal of creating an industry-wide resource. The model provided a flexible foundation that was highly adaptable for various semiconductor applications. Additionally, the permissive licensing allowed individual companies to customize solutions while maintaining total control and ownership.

Open-source ecosystem makes fine-tuning a highly specialized model easier

With Llama, Aitomatic and its collaborators could extensively customize the model to meet their needs. They fine-tuned SemiKong in multiple stages to ensure it achieved high accuracy and relevancy.

The company began with general semiconductor knowledge and moved into progressively more specialized subdomains like manufacturing and testing. Throughout the process, they drew from a large corpus of semiconductor industry documents, research publications and anonymized design and manufacturing data. Beyond that, they were able to tap into the expertise of a strong developer ecosystem.

“Licensing terms were a key Llama differentiator. They give semiconductor companies full ownership of AI models and agents, which is essential for the mission-critical nature of their businesses. These companies don't want to be boxed in by proprietary tools.”

Christopher Nguyen
Chief Executive Officer, Aitomatic

“Choosing Llama allowed us to collaborate rapidly on SemiKong. The open-source Llama toolchain and community provided excellent affordances for efficient fine-tuning. Thanks to that foundation, we could focus our domain expertise and technical resources on semiconductor-specific corpus construction and expert evaluation pipelines.”

Vinh Luong
Head of Open Source, Aitomatic

Aitomatic tested SemiKong’s performance using a combination of standard NLP metrics and semiconductor benchmarks developed with industry partners, including world-leading semiconductor equipment makers and fabs. The evaluation was extremely promising, indicating that SemiKong outperformed state-of-the-art generic closed-source LLMs in understanding and generating semiconductor-related content across criteria such as:

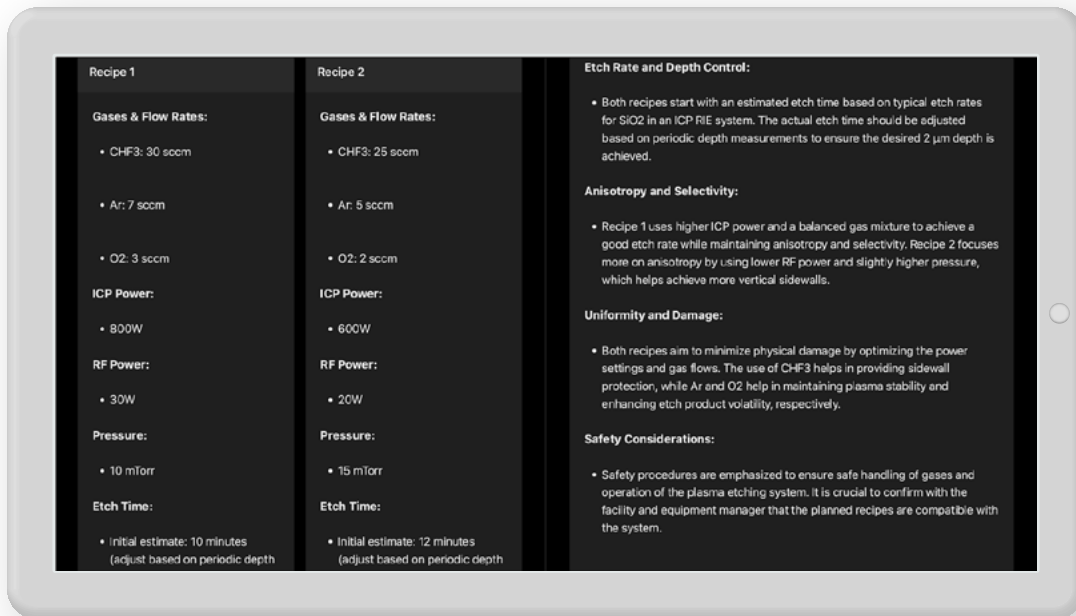
- Clarity and directness (C&D)
- Practicality and immediate usability (PIU)
- Efficiency and brevity (E&B)
- Logical flow and coherence (LFC)
- Expert-to-expert communication (EEC)
- Use of examples and specificity (UES)

Model	C&D	PIU	E&B	LFC	EEC	UES	Total
Claude-3.5-Sonnet	3.80	3.44	3.15	3.82	3.67	3.37	21.25
Claude-3-Haiku	3.95	3.54	3.64	3.92	3.80	3.31	22.16
Claude-3-Opus	3.88	3.47	3.50	3.86	3.75	3.29	21.75
Command-R	3.76	3.46	3.38	3.74	3.64	3.22	21.20
GPT-3.5	3.32	2.86	3.05	3.08	3.00	2.59	17.90
SemiKong-70B	3.87	3.84	3.59	3.99	3.90	3.46	22.65

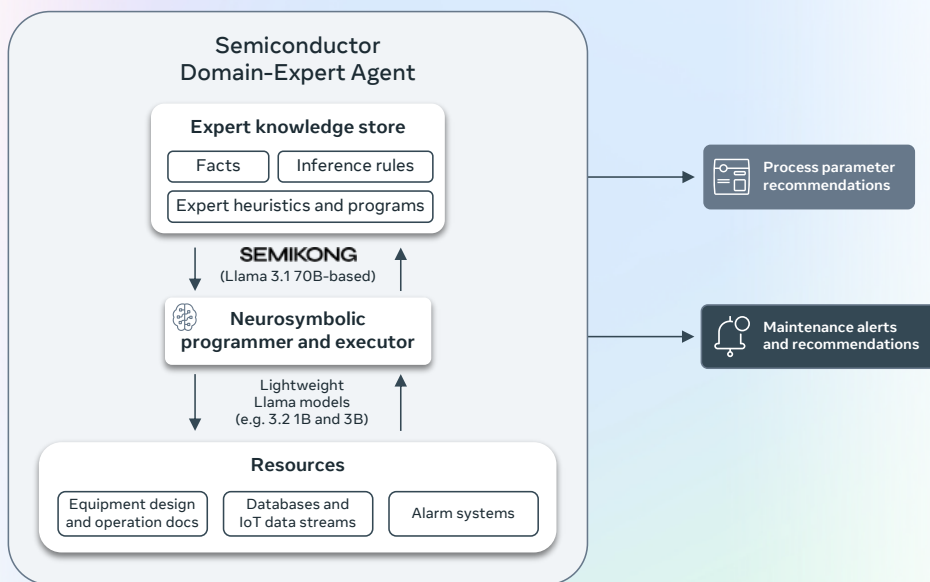
SemiKong outperforms state-of-the-art LLMs on semiconductor Q&A quality.

Powering high-value semiconductor AI applications

Aitomatic and its customers have used SemiKong in Domain-Expert Agents (DXAs) developed to accelerate key processes in semiconductor design and manufacturing. “SemiKong is set to redefine semiconductor AI,” says Nguyen. “This open innovation model, enabled by the AI Alliance, harnesses collective expertise for industry-specific challenges.”



A SemiKong-powered semiconductor etching recipe optimizer speeds up process engineers’ analysis time.



The semiconductor etching recipe optimizer DXA pulls from specialized information to provide expert responses.

The outcome

Advancement in chip design, manufacturing and testing

With Llama as the foundation, Aitomatic now offers a powerful domain-specific model to help the industry build AI applications that improve chip design process, manufacturing troubleshooting and more.

Aitomatic anticipates that the model reduces time-to-market for new chip designs by 30%, increases first-time-right chip manufacturing by 25%, makes onboarding for semiconductor professionals 50% faster and boosts patent filings for new solutions by 15%.

“Thanks to Llama’s flexible architecture and open-source foundation, we were able to build a customizable, semiconductor-specific language model that can reduce AI application development costs for companies across the sector.”

Christopher Nguyen
Chief Executive Officer, Aitomatic

30%

reduction in
time-to-market for
new chip designs

25%

increase in
first-time-right chip
manufacturing

50%

faster onboarding
for semiconductor
professionals

15%

jump in patent filings
from accelerated
innovation



Conclusion

Llama lays the groundwork for continued excellence in semiconductor AI development

Many semiconductor companies already see SemiKong as an essential open-source LLM foundation for developing proprietary AI models and tools specific to their operational processes. As Llama and the open-source development ecosystem evolve, Aitomatic will continually improve SemiKong with new architectures and training techniques.



How can Llama enable your business?

Discover more about developing generative AI applications with open-source Llama large language models that bring unmatched control, customization and flexibility.

[Learn More](#)[Related Stories ▶](#)