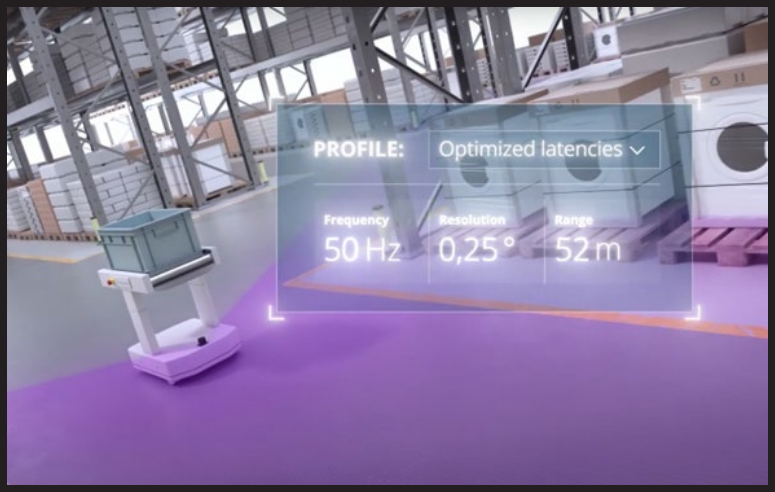
SICK AG Powers 2D LiDAR Sensor with AMD adaptive SoCs

AMD × SICK Sensor Intelligence.



EXECUTIVE SUMMARY

In a competitive global market where cost, precision, and efficiency converge, SICK AG has created compact, high-performance, and cost-optimized 2D LiDAR sensors based on AMD adaptive computing technology. Designed primarily for logistics applications, including autonomous guided vehicles (AGVs) and mobile robots, the 2D-LiDAR sensors needed to deliver exceptional accuracy and responsiveness while remaining affordable enough to compete in cost-sensitive global markets.

By integrating the AMD Zynq™ UltraScale+™ MPSoC, SICK achieved a breakthrough in performance, miniaturization, and energy efficiency. The result was a streamlined solution that consolidated laser control, time-of-flight computation, and real-time data processing into a single embedded architecture.

INTRODUCTION

Founded in 1946, SICK AG has grown into one of the world's most respected providers of sensor intelligence and industrial automation technology. Headquartered in Waldkirch, Germany, the company is known for its comprehensive portfolio of optical sensors, including high-performance and low-cost 2D and 3D LiDAR systems.

Within SICK's Dynamic Ranging business unit, project manager Jens Kornmayer and his team focus on developing LiDAR sensors for a wide range of industrial applications—from precision measurement and mapping to safety and navigation. The combination of high-performance LiDAR in 2D cost sensitive systems represents SICK's commitment to making advanced LiDAR technology accessible to high-volume logistics markets, particularly in Asia.

"We aim to have a portfolio from high-end sensors down to cost-sensitive sensors," explained Kornmayer. "This portfolio is our answer to the demand for cost-effective yet robust performance in logistics automation."

CHALLENGES

SICK set out to design a new class of affordable LiDAR sensors, but the company faced a range of technical and market-driven challenges.

The most significant challenge was achieving high performance at a reduced cost. Competing in the Asian market required a dramatic reduction in CPU and system costs without compromising measurement accuracy. In addition, the sensor needed to handle extremely high data throughput, processing thousands of measurements per scan cycle and up to 50 frames per second. Form factor was another constraint.

INDUSTRY

Industrial

AT A GLANCE

- AMD Zynq™ UltraScale+™ MPSoC enabled full LiDAR signal processing within one compact system.
- Open and transparent engineering collaboration accelerated product development.
- SICK's 2D LiDAR sensor achieved top-tier accuracy and throughput at a competitive price point.
- AMD integration simplified design, reduced power consumption, and minimized size.
- The collaboration established a model future 3D LiDAR innovation.

CHALLENGES

Create affordable, high-performance LiDAR solutions and reduce costs and boost processing efficiency, power efficiency, and reliability

SOLUTION

SICK created a compact LiDAR solution using AMD Zynq UltraScale+ MPSoC, integrating all processing for fast, precise real-time mapping

RESULTS

The affordable, high-performance 2D LiDAR sensor leverages AMD technology for cost efficiency, high throughput, and reliability.

AMD TECHNOLOGY

AMD Zynq™ UltraScale+ MPSoC

Mounted on autonomous-guided vehicles and mobile robots, the sensor had to be compact, lightweight, and energy-efficient while maintaining thermal stability in varied warehouse and factory environments. Finally, reliability was critical. Each device had to meet SICK's stringent failure-rate and measurement-precision standards.

"We have very high standards in measurement performance," said Kornmayer. "Our systematic and statistical errors are extremely low. The design must be robust, and that demands a very performant processor architecture."

Key technical challenges included:

- Balancing cost efficiency with high computational performance
- Managing thousands of time-of-flight measurements per scan
- Achieving integration and compactness for mobile deployment
- Maintaining low power consumption and temperature control
- Ensuring reliability under strict quality and lifetime metrics

SOLUTION

The collaboration between AMD and SICK resulted in a deeply integrated embedded processing product offering based on AMD Zynq™ UltraScale+™ MPSoC technology. This single-chip architecture allowed SICK to consolidate multiple system functions—laser control, signal acquisition, analog-to-digital conversion, and operating system management—into one powerful and compact design.

As Christoph Maier, a senior design engineer at SICK, explained, "There's high throughput, thousands of measurements per cycle, and the AMD technology lets us handle acquisition and processing in one system rather than multiple components."

The AMD adaptive MPSoC handled the time-of-flight processing required for LiDAR operation, managing up to three echoes per measurement point and producing detailed 2D maps at high frame rates. The device's processing power and flexibility were key in meeting the demands of real-time environmental mapping and navigation.

Technical Highlights:

LiDAR Type	2D Time-of-Flight (270° scanning angle)
Resolution	Up to 0.1° (High-end) / 1° (Low-cost)
Frame Rate	30–50 fps
Echo Processing	Up to 3 echoes per point
Processing Core	AMD Zynq™ UltraScale+™ MPSoC

IMPLMENTATION STRATEGY

From the beginning, SICK and AMD established a co-engineering model rooted in transparency, shared expertise, and iterative problem-solving. Both companies recognized that success required open collaboration between their R&D teams.

SICK began by sharing relevant core intellectual property and performance requirements with AMD, allowing engineers to analyze feasibility and model potential failure rates. Together, the teams refined system parameters and developed a customized SoC configuration suited for LiDAR workloads. Extensive thermal, environmental, and reliability testing ensured long-term stability and quality.

"We figured out that we needed close cooperation between our R&D groups," Kornmayer recalled. "We shared our application data, defined constraints, and worked through temperature and reliability tests to ensure quality."

The trust between the two organizations grew from a long-standing history. As Maier noted, "We've used AMD devices for over 30 years. That relationship gave us the confidence to open our design process and develop this new product together."

RESULTS AND IMPACT

The collaboration produced remarkable results, positioning a 2D LiDAR sensor as a powerful yet affordable sensor for the rapidly expanding logistics and automation sectors. By leveraging the AMD embedded processing architecture, SICK was able achieve higher throughput and reduced cost.

Cost Efficiency	Reduced CPU and bill-of-material costs through SoC integration
Performance	Up to 2700 measurements per cycle with near-zero latency
Form Factor	Miniaturized to fit compact AGV systems
Energy Efficiency	Optimized power profile for continuous operation
Time-to-Market	Accelerated release through joint R&D execution

NEXT STEPS

Looking ahead, SICK is preparing to integrate advanced object classification functions into its next-generation 3D LiDAR sensors—an evolution that will again leverage AMD's embedded platforms to enable intelligent perception and decision-making at the edge.

"Future systems will build on the same AMD foundation that has made our 2D LiDAR cost-optimized sensor successful," Kornmayer said.

CALL TO ACTION

To explore how AMD Zynq UltraScale+ adaptive SoCs can power your next-generation sensor solutions, please visit: https://www.amd.com/en/products/adaptive-socs-and-fpgas/soc/zynq-ultrascale-plus-mpsoc.html

ABOUT SICK AG

From factory automation to logistics automation and process automation, SICK's sensor solutions are keeping industry moving. As a technology and market leader, SICK provides sensor intelligence and application solutions that create the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents, and preventing damage to the environment., visit the SICK website at https://www.SICK.com/us/en/.

ABOUT AMD

For more than 50 years AMD has driven innovation in high-performance computing, graphics, and visualization technologies. Billions of people, leading Fortune 500 businesses, and cutting-edge scientific research institutions around the world rely on AMD technology daily to improve how they live, work and play. AMD employees are focused on building leadership high-performance and adaptive products that push the boundaries of what is possible. For more information about how AMD is enabling today and inspiring tomorrow, visit the AMD (NASDAQ: AMD) website, blog, LinkedIn, and X pages.