

## CUSTOMER

XIMEA  
www.ximea.com

## INDUSTRY

Imaging and Vision

## CHALLENGES

- Specialized legacy processing platforms have limited ecosystem of supported imaging software
- Frustrating hardware/software incompatibilities
- Cumbersome software maintenance processes
- Having to stock and support specialized camera lines to accommodate customer-specified image processing libraries

## SOLUTION

- XIMEA CURRERA-G 'PC Camera' equipped with the AMD Embedded G-Series processor
- A staggering 45X performance gain – 2GFLOPs to 90GFLOPs – over the Intel Atom-based camera

## RESULTS

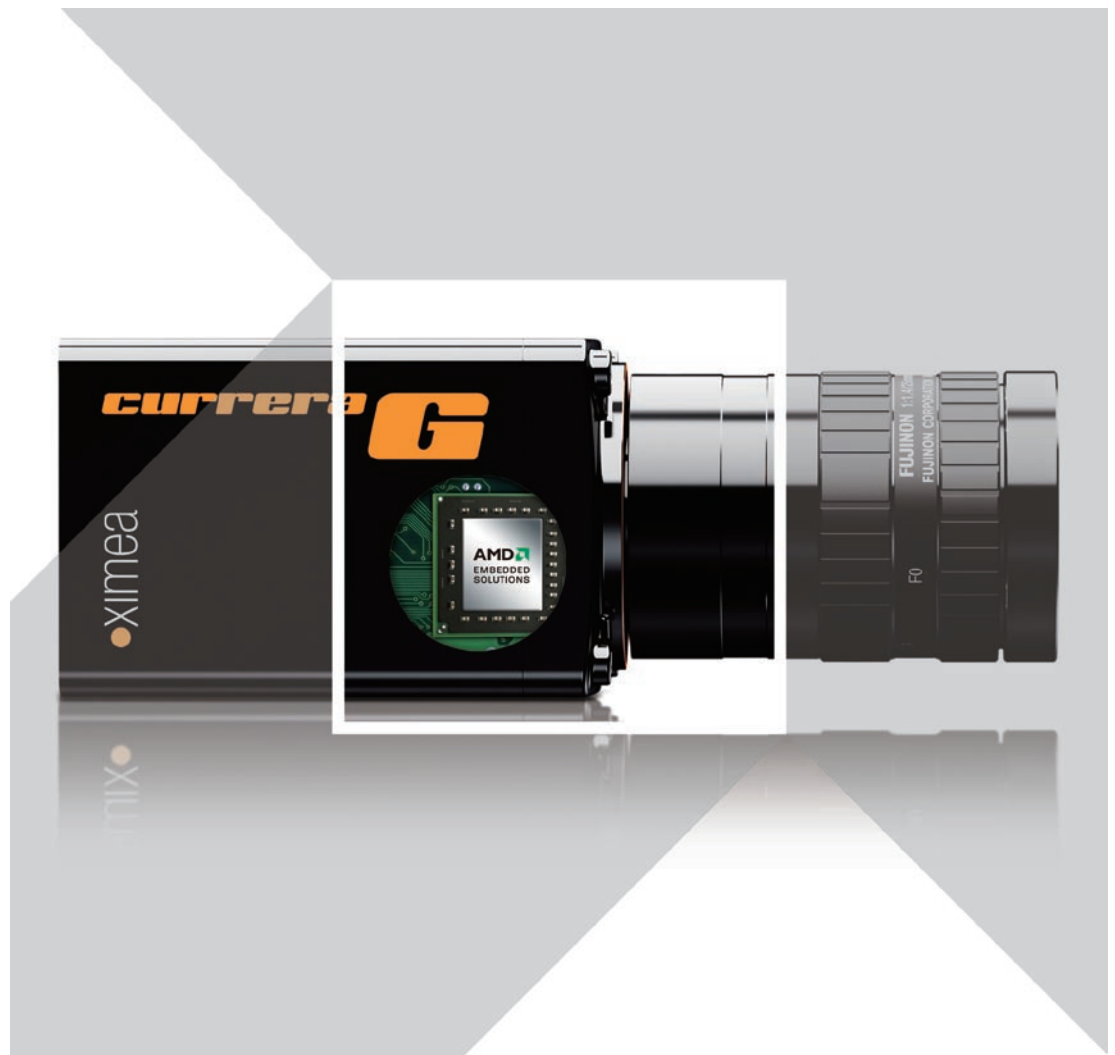
- Dramatic gains in processing power and a growing ecosystem of software and development tools have yielded advanced system capabilities that open the door to greater overall productivity and versatility
- The ability to tap into Heterogeneous Systems Architecture (HSA) technology to achieve an unprecedented processing performance boost
- Integrators are now liberated from having to stock and support specialized camera lines to accommodate customer-specified image processing libraries, manipulate code for re-use, or develop custom APIs themselves.

## AMD TECHNOLOGY AT A GLANCE

AMD Embedded G-Series APUs

*"The AMD Embedded G-Series APU within the CURRERA-G PC camera helps enable a fully-optimized data path from image sensor to application, eliminating CPU overhead during image data delivery."*

MAX LARKIN  
CEO, Ximea



## Smart Cameras Getting Smarter

**The AMD Embedded G-Series processor gives XIMEA CURRERA-G 'PC Camera' 45X performance boost over earlier-generation Intel-based model**

*90 GFLOPs processing power sets new standard for machine vision smart cameras*

The evolution of machine vision cameras has in many ways mirrored the evolution of the modern personal computer. Ever shrinking form factors, dramatic gains in processing power and a growing ecosystem of software and development tools have yielded advanced system capabilities that open the door to greater overall productivity and versatility. Tapping into Heterogeneous Systems Architecture (HSA) technology to achieve an unprecedented processing performance boost, the design visionaries at smart camera maker XIMEA have married cutting-edge machine vision and x86 technology to pioneer the world's highest-performance 'PC camera.'

XIMEA, a leading innovator of smart camera and machine vision technology, faithfully adheres to a centuries-old design principle championed

by Leonardo da Vinci: "Simplicity is the ultimate sophistication." This core philosophy has guided XIMEA's design team throughout the development of the company's flagship CURRERA series of smart cameras – or 'PC cameras' – the first intelligent vision systems to forego traditional DSP, RISC and FPGA-based processing platforms in favor of x86 processor architectures. This shift away from specialized legacy processing platforms and the limited ecosystem of supported imaging software has proven to be a tipping point for the machine vision industry, allowing integrators and system builders to overcome the frustrating hardware/software incompatibilities and cumbersome software maintenance processes that had previously impeded them.

Designing its CURRERA series PC cameras on the x86 processor platform enabled XIMEA to achieve PC-caliber performance and application agility complemented by a rich ecosystem of industry-standard, x86-optimized software, applications and development environments. Full Microsoft® Windows® and Linux® operating system compatibility would dramatically enhance vision system development, deployment and management efficiencies while providing smoother interoperability with x86 Internet backbone infrastructure to ensure improved remote management capabilities. Collectively these efficiencies yield significantly leaner cost structures for integrators and end users alike, ensuring that XIMEA's CURRERA series PC cameras deliver greater value than traditional smart cameras.

Shipped with fully-tested Microsoft Windows- and Linux-based application programming interfaces (APIs) for 25 of the most common image processing libraries, XIMEA's CURRERA series PC cameras afford integrators true plug-and-play deployment flexibility. Integrators are now liberated from having to stock and support specialized camera lines to accommodate customer-specified image processing libraries, manipulate code for re-use, or develop custom APIs themselves. CURRERA series PC cameras ensure near universal application interoperability, right out of the box. Sophisticated, yet simple.

## PERFORMANCE POTENTIAL

With the development of its maiden CURRERA PC camera – the CURRERA-R camera – XIMEA achieved aggressive design goals centric to form factor and integration, ultimately yielding a vision system that incorporated a fully-functional personal computer, standard PC peripherals and Internet-enabled remote management capabilities within a stunningly elegant, ultra compact 59 x 110 x 48 mm IP67-class industrial housing. The introduction of XIMEA's CURRERA series PC cameras would fundamentally transform intelligent vision system technology, enabling advanced new capabilities for a broad range of smart camera applications spanning machine vision, automated inspection, non-contact measurement and security.

But XIMEA wasn't finished. The Intel Atom processors at the heart of the CURRERA-R PC cameras limited system performance to approximately 2 GFLOPs – impressive performance compared to traditional smart cameras, but not enough to meet XIMEA's ambitious performance goals. Its design team envisioned a smart camera capable of accelerating part-per-minute inspection rates to unprecedented speeds. It sought a processing platform that would enable image detection and identification at a level of precision previously unimagined. It recognized that for integrators and system builders to embrace this new class of smart cameras, CURRERA PC cameras needed to prove their value in the field as a means to achieve huge gains in productivity, quality control, and overall vision system versatility.

Convinced that the full evolution to x86-caliber smart camera performance and agility would not be realized via traditional CPU architectures, XIMEA's design team shifted its attention from Intel Atom processors to the AMD Embedded G-Series processor featuring Heterogeneous Systems Architecture (HSA) technology.

## FROM 2 GFLOPS TO 90 GFLOPS WITH HSA TECHNOLOGY

With the introduction of its second-generation CURRERA PC cameras – the CURRERA-G series cameras, based on the AMD Embedded G-Series platform – XIMEA boosted the processing performance of its CURRERA platform from 2GFLOPs to 90GFLOPs<sup>1</sup> – a staggering 45X performance gain. The CURRERA-G PC camera houses a single-board-computer designed to accommodate an AMD Embedded G-Series accelerated processing unit (APU), which combines a low-power CPU and a discrete-level GPU on a single die with a high-speed bus architecture. Combining a GPU core on the same die as the CPU enables the system to offload computation-intensive pixel data processing from the CPU to the GPU. Freed from this task, the CPU can serve I/O requests with much lower latency, thereby dramatically improving the real-time performance of the whole system.

The AMD Embedded G-Series APU within the CURRERA-G PC camera helps enable a fully-optimized data path from image sensor to application, eliminating CPU overhead during image data delivery. Direct access to the unified memory shared between the CPU and GPU enables a true zero-copy data transfer path and the lowest possible latency. Meanwhile the general purpose vector processor cores within the integrated GPU – 80 shader cores running at 500MHz (AMD G-T56N) – drive the ultra high speed parallel processing required to handle intensive numerical computations.

In addition to offering performance that's an order of magnitude greater than most competing smart cameras, CURRERA-G PC cameras offer resolutions from WVGA to 5 megapixel (MP) and feature a pair of MicroSD card slots. CURRERA-G PC cameras come with a variety of I/O options, including Gigabit Ethernet (GigE), USB interfaces, VGA, RS232, and eight isolated Digital Inputs and Outputs, programmable current-controlled output for LED lighting, and a graphically configurable micro PLC capable of running at sub-microsecond jitter.

## SMALLER FASTER BETTER

The addition of a GPU to the CURRERA processing module by way of the AMD Embedded G-Series APU would have been extremely difficult, if not impossible, to achieve within the specified system form factor targets if not for the AMD APU architecture. By reducing the footprint of a traditional three-chip platform to just two chips – the APU and the companion controller hub – design complexity is simplified and XIMEA's designers were much better equipped to realize their aggressive form factor goals.

With the development of the AMD Embedded G-Series APU-based CURRERA-G PC camera, XIMEA's designers were enabled to integrate the processor module and solid-state micro cooling components within an enclosure nearly identical in size (62 x 105 x 62 mm) to the earlier generation Intel Atom-based CURRERA-R PC cameras. In the end, XIMEA achieved a 45X processing performance boost for its CURRERA PC camera platform, without giving an inch – literally – on system form factor dimensions.

## SIMPLICITY AND EFFICIENCY

AMD's early and ongoing support for the cross-platform, non-proprietary Open Computing Language (OpenCL™) programming framework has played to XIMEA's favor, equipping developers to easily and more cost-effectively program code that accelerates image processing performance for their unique CURRERA-G-based vision system applications. With OpenCL APIs, developers can repurpose code across CPU, GPU and APU platforms from the leading processor vendors, thereby maximizing the value of their investment in source code development.

XIMEA's innovation with x86 processing platforms and the OpenCL framework is unique in the smart camera industry, distinguishing XIMEA's commitment to promoting end-to-end vision system design and management efficiencies spanning hardware and software. And just as XIMEA's AMD Embedded G-Series processor-based CURRERA-G PC cameras provide integrators and end users with ample performance overhead to future-proof their investments in the CURRERA platform, so too does OpenCL allow developers to future-proof their source code.

In this way, XIMEA's technology sophistication makes high-performance machine vision simpler than ever. Da Vinci would be proud.

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## ABOUT XIMEA

XIMEA GmbH believes that the best industrial, smart, and scientific cameras offer the highest levels of processing power, compatibility, and support at a competitive price. That's why for more than 20 years, XIMEA has designed the smartest, most compact industrial cameras for machine vision applications in motion control, assembly, robotics, and industrial inspection and process control, as well as scientific cameras for life-science, security, and defense applications. Learn more about XIMEA at [www.ximea.com](http://www.ximea.com).

## ABOUT AMD

AMD is a semiconductor design innovator leading the next era of vivid digital experiences with its groundbreaking Accelerated Processing Units (APUs) that power a wide range of computing devices. AMD Embedded Solutions give designers ample flexibility to design scalable, x86- based, low-cost and feature-rich products, and drive energy conservation into their systems without compromising application performance or compatibility, graphics performance or features. For more information, visit [www.amd.com/embedded](http://www.amd.com/embedded).

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1 In testing conducted by AMD performance labs, 18 W AMD G-Series APUs demonstrated approximately 90 GFLOPS. In testing conducted by XIMEA, the Intel Atom Z530 demonstrated approximately 2 GFLOPs using the SiSoft Sandra CPU MFLOPs test.

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