



Application Brief

Data Handling, Throughput, and Image Processing: Key Features for Machine Vision Designs

AMD Solutions for Machine Vision Applications

AMD Embedded R-Series APUs (Accelerated Processing Units) and G-Series SOCs (Systems-on-Chip) are helping enable another leap forward for machine vision technology. The silicon-level integration of a low-power x86 CPU and the parallel processing performance of a programmable, discrete-class general-purpose graphics processing unit (GPGPU) in a single device drives the high-speed processing that is essential for achieving high-performance machine vision. 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 multi-core GPU, distributing the processing workload across available processor cores in parallel to help improve the real-time performance of the whole system. This can yield an order of magnitude increase in image processing performance versus serial task execution on a CPU alone and offers the simplified hardware architecture, data handling, and connectivity of a standard PC platform. While traditional benefits of these solutions include long-term availability and low power consumption, applications built around the AMD G-Series SOCs and R-Series APUs also offer software compatibility support that can broadly scale across machine vision solutions.

AMD Embedded Solutions Feature a Variety of Attributes for Machine Vision Applications

Machine vision technology is evolving quickly, fueled by dramatic gains in processing performance through innovative heterogeneous architectures, which accelerate image processing functions and handle data transfer and I/O respectively. The relatively recent arrival of PC-based "smart cameras" that forego conventional DSP and FPGA-based processing platforms heralds another significant advance in intelligent vision system technology as the industry shifts away from specialized legacy processors and narrowly supported imaging software in favor of the more versatile x86 platform.

- PC-compatible solutions backed by an ecosystem of software and tools to help deliver a full solution, easily integrate with enterprise networks, and shorten design cycles
 - *Software compatibility between smart cameras and machine vision PCs*
 - *Broad ecosystem support to help simplify development*
 - *Support for Microsoft® Windows® and Linux® operating systems*
 - *Easy networking with IP-based industrial and enterprise networks*
- Range of price, power, and performance: APU and SOC solutions for low-power smart cameras or high-performance PC-based designs
 - *Ability for same design to scale from smart camera to compact vision system*
 - *Support for multiple product categories with a single software architecture*
- Excellent performance on highly integrated and low-power APU and SOC solutions to help simplify design into small form factor and fanless applications
 - *Low power and high integration, well suited for compact smart camera designs*
 - *Combination of an image processing engine, full complement of I/O, and excellent data management capabilities on a single device*
 - *Support for 2-4 USB 3.0 ports and accessible interface to multiple-Gb Ethernet ports through PCI Express®*
- OpenCL™ acceleration delivers high compute performance on the GPU
 - *From 46 to 563 SP GFLOPS^{1,2} compute performance*
 - *Royalty-free open standard*
 - *Availability of more than 70 open source functions for accelerated machine vision applications³*
- Support for remote management across families
 - *Increased system reliability and reduced downtime*
 - *AMD DAS 1.0 with out-of-band remote management solution support, to remotely manage devices even when the OS is not running*

AMD Embedded Solutions for Machine Vision Applications

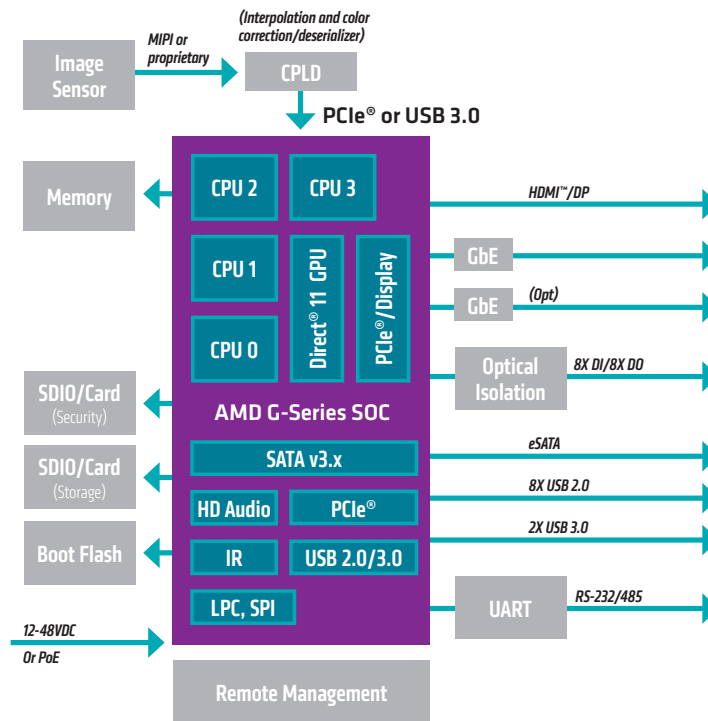
FOR SMART CAMERAS

- **Recommended: AMD GX-210HA SOC**
 - Low-power at only 4.1W average power⁴
 - Highly Integrated Dual-core SOC
 - Good image processing performance
 - Higher performance alternative: AMD GX-415GA SOC

FOR MACHINE VISION SERVERS OR COMPACT IMAGING SYSTEMS

- **Recommended: AMD R-464L APU**
 - Excellent graphics performance
 - High x86 performance and data throughput
 - 563 SP GFLOPS⁵ image processing performance
 - Lower power/cost scalable alternative: AMD GX-420CA SOC (10.8W Average Power)⁵

PC-based Smart Camera with AMD G-Series SOC



For more information, or to discuss which AMD-based solution might be right for you, please contact your local AMD Embedded Solutions sales representative:

www.amd.com/embeddedsales or see www.amd.com/industrial

¹ Calculated SP GFLOPS = (# of x86 cores x (28-bit (FPUs) / 32-bit (SP Operation)) * CPU Base Frequency) + (# of shader units * (64-bit (shader) / 32-bit (SP Operation)) * GPU Max Frequency). EMB-21

² The calculated single precision GFLOPs for the AMD G-716R is 46 and for the Intel Atom D2700 is 8.52. Calculated SP GFLOPs = (# of x86 cores x (# of FP bits per core / 32 bit (SP Operation)) * CPU Frequency) + (# of OpenCL enabled GPU cores * (# of FP bits per GPU core / 32 bit (SP Operation)) * GPU Frequency). EMB-31

³ Accelerated functions in OpenCV 2.4.3 (updated in 2.4.4) downloadable under free BSD license from <http://opencv.org>.

⁴ The average power for the AMD GX-210HA SOC is 4.1 watts, determined by averaging the results of the measured average power of the SOC running the following benchmarks: 3DMark[®] 11, AMD Sys Stress Test CPU, AMD Sys Stress Test CPU 6 GPU, AMD Sys Stress Test GPU, WinBench[™] 99, CoreMark, Game: Meat Boy, PCMark[®] 7, POV-Ray, Sandra 2011, Game: Street Fighter. Testing was performed on an AMD E1-2100 (Rev A1) that is equivalent to the AMD GX-210HA SOC. System configuration: AMD E1-2100 @ 70°C, "Lame" development platform, 4GB RAM, Windows[®] 7 Ultimate. Please see AMD publication ID 53395A for more information. EMB-41

⁵ The average power for the AMD GX-420CA SOC is 10.8 Watts, determined by averaging the results of the measured average power of the SOC running the following benchmarks: 3DMark[®] 11, AMD Sys Stress Test CPU, AMD Sys Stress Test CPU 6 GPU, AMD Sys Stress Test GPU, WinBench[™] 99, CoreMark(Multi-thread), Game:Meat Boy, PCMark[®] 7, POV-Ray(all), Sandra 2011, Game: Street Fighter. System configuration: AMD GX-420CA @ 60°C, "Lame" development platform, 4GB RAM, Windows 7 Ultimate. Please see AMD Publication ID 53395B for more information.

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