



Boosting Performance for Mobile Medical Devices - *AMD's Embedded G-Series SOCs and congatec's conga-TCG Computer-on-Module*

Evolving Design with AMD Embedded G-Series SOC

AMD's Embedded G-Series System-on-Chip (SOC) platform has enabled a new range of power and performance options for designers of mobile medical devices – combining x86 architecture with AMD's deep expertise in graphics performance. The AMD Embedded G-Series SOC platform is a high-performance, low-power SOC design supporting dual or quad-core CPU variants, integrated discrete-class AMD Radeon GPU and I/O controller on the same die.

AMD's Embedded G-Series SOC product family also includes graphics features capable of supporting beyond HD resolutions across multiple displays. This innovative SOC design integrates high performance computing and graphics processors in a single chip solution, incorporating the next-generation computing power of AMD's "Jaguar" based processor and AMD Radeon™ graphics cores in a compact package. Designers have a competitive advantage, delivering designs that capitalize on smaller size, higher performance and more energy-efficient processors.

Advantage SOC

The AMD G-Series SOC product family delivers significant performance advancements compared to AMD's groundbreaking prior generation, the AMD Embedded G-Series APU (Accelerated Processing Unit). The single-chip G-Series SOC provides up to a 113 percent increase in CPU performance.¹ AMD G-Series SOC's advanced GPU supports DirectX® 11.1, OpenGL 4.2 and OpenCL™ 1.29; this enables parallel processing and high-performance graphics processing with up to 20 percent improvement contrasted to AMD's G-Series APU.² Designs using AMD's G-Series SOC also recognize an overall 33 percent footprint reduction versus the first generation AMD G-Series solution, ensured by 28nm process technology and a 24.5mm x 24.5mm BGA package.³ Industry standard benchmarks validate the G-Series SOC's superior performance-per-watt in the low-power x86 microprocessor product class, with options ranging from 9W to 25W.⁴ This performance advantage supports an exceptional HD visual experience and provides a heterogeneous computing platform for parallel processing and high-performance graphics processing.

Optimized for Power and Performance

These dramatic performance improvements enable a new spectrum of graphic-intensive applications – facilitating small form factor embedded designs with exceptional levels of quality, reliability, longevity, and innovation. As designs continue to evolve into smaller, space-constrained environments, this level of integrated performance has become a design essential. As a small footprint, power-efficient platform for content-rich multimedia and workload processing, the AMD G-Series SOC maintains ideal performance within low power designs, driving small form factor and mobile products in the medical marketplace.

AMD SOC-Based COMs Fuel Graphics-Driven, Mobile Medical Applications

As modern medicine is characterized by an ever-increasing density of information, both doctors and patients benefit from access to detailed graphical displays of vital statistics, historical and real-time patient data, and high-resolution diagnostic images. These developments require continued increases in embedded processing performance, and challenge designers to address growing demands for sophisticated image display and fast data and image processing. At the same time, diagnosis and treatment devices are becoming more mobile, remaining poised to deliver optimal care in a broad range of healthcare settings.

congatec has tapped the power and performance of AMD's new SOC to extend its COM Express product range – enabling its conga-TCG product family with an excellent performance-per-watt ratio and flexible task allocation via the CPU and GPU integrated on a single die. Ideal for cost-sensitive visualization and control applications, the conga-TCG provides a flexible, small form factor platform optimized for graphically demanding embedded computing. Combined with the inherent flexibility and scalability of the COMs platform, medical device manufacturers can get to market quickly with high-performance products and remain poised for the next-generation performance demands of future product generations.

COM Express-based COMs are proven in medical design as a standards-based means to address these challenges and bring products to market quickly – meeting the demand for high performance, low power solution that extend mobile performance. By delivering the core functionality of an embedded PC, COMs enable developers to concentrate on the fundamentals of the specific application and its required peripherals. By adding customer-specific I/O on their accompanying carrier board, COMs can then be easily integrated into various computing environments. With medical equipment manufacturers facing lengthy FDA approval times, this is an important consideration in getting final product to market. Customization is completed at the carrier board level allowing medical OEMs to condense the development phase, decrease overall systems cost and expedite system integration. In addition, the computing power of interchangeable COMs and interfaces is scalable. In next generation designs, designers can merely upgrade processors to continuously improve performance.



- 1 AMD GX-415GA scored 209 and the AMD G-T56N scored 98 based on an average of Sandra Engineering 2011 Dhrystone, Sandra Engineering 2011 Whetstone and EEMBC CoreMark Multi-thread benchmark results. AMD G-T56N system configuration used iBase MI958 motherboard with 4GB DDR3 and integrated graphics. AMD GX-415GA system configuration used AMD "Larne" Reference Design Board with 4GB DDR3 and integrated graphics. All systems running Windows® 7 Ultimate for Sandra Engineering and Ubuntu version 11.10 for EEMBC CoreMark.
- 2 AMD GX-415GA scored 864 and the AMD G-T56N scored 724 based on an average of 3DMark® 06 1280x1024 and PassMark Performance Test 7.0 2D Graphics Suite benchmark results. AMD G-T56N system configuration used iBase MI958 motherboard with 4GB DDR3 and integrated graphics. AMD GX-415GA system configuration used AMD "Larne" Reference Design Board with 4GB DDR3 and integrated graphics. All systems running Windows® 7 Ultimate with DirectX 11.0.
- 3 AMD G-Series SOC FT3 BGA package dimension 24.5mm x 24.5mm = 600.25 mm² SOC; AMD G-Series APU FT1 and Controller Hub two-chip platform: 19mm x 19mm + 23mm x 23mm = 890 mm²; 33% improvement.
- 4 The low-power x86 microprocessor class includes: GX-420CA @ 25W TDP (scored 19); GX-415GA @ 15W (25), GX-217GA @ 15W (17), GX-210HA @ 9W (20), G-T56N @ 18W (12), G-T52R @ 18W (7), G-T40N @ 9W (14), G-T16R @ 4.5W (19), Intel Atom N270 @ 2.5W (20), Intel Atom D525 @ 13W (9), Intel Atom D2700 @ 10W (12) & Intel Celeron G440 @ 35W (5). Performance score based on an average of scores from the following benchmarks: Sandra Engineering 2011 Dhrystone ALU, Sandra Engineering 2011 Whetstone iSSE3, 3DMark® 06 (1280 x 1024), PassMark Performance Test 7.0 2D Graphics Mark, and EEMBC CoreMark Multi-thread. All systems running Windows® 7 Ultimate for Sandra Engineering, 3DMark® 06 and PassMark. All systems running Ubuntu version 11.10 for EEMBC CoreMark. All configurations used DirectX 11.0. AMD G-Series APU system configurations used iBase MI958 motherboards with 4GB DDR3 and integrated graphics. All AMD G-Series SOC systems used AMD "Larne" Reference Design Board with 4GB DDR3 and integrated graphics. Intel Atom D2700 was tested with Jetway NC9KDL-2700 motherboard, 4GB DDR3 and integrated graphics. Intel Celeron system configuration used MSI H61M-P23 motherboard with 4GB DDR3 and integrated graphics. Intel Atom N270 system configuration used MSI MS-9830 motherboard with maximum supported configuration of 1GB DDR2 (per <http://download.intel.com/design/intarch/manuals/320436.pdf>;) and Intel GM945 Intel Atom D525 used MSI MS-A923 motherboard with platform integrated 1GB DDR3 and integrated graphics.