Powerful graphics in squared form factor

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AMD graphics technology is entering the eNUC world: manufactured entirely in Germany, the embedded eNUC board from Datakamp features rugged multimedia capabilities and long-term availability.
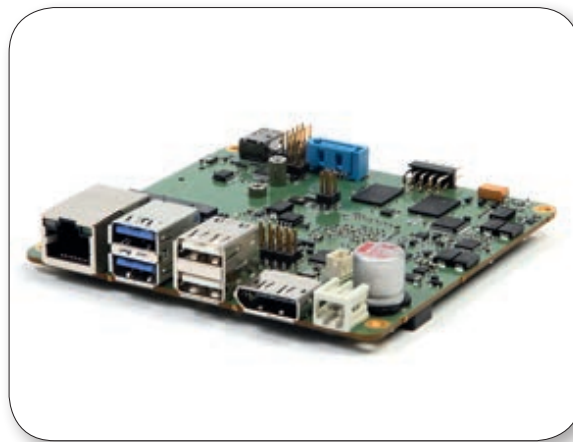

Figure 1. The all-in-one eN-GXSOC has been designed and developed for 24/7 use in harsh industrial environments and utilizes an innovative passive cooling system.

■ Commercial NUC systems are nice little products that can reside on office desktops or in private TV racks without requiring much space. They offer customers all the performance and connectivity they need for internet browsing, media streaming, office applications, home automation and so on. Adapted to the embedded world, the standardized embedded NUC (eNUC) form factor also offers a freely programmable platform for developing smart IoT gateways and manifold other embedded control systems and industrial thin clients that demand a powerful small form factor and high cost efficiency.

Applications built on eNUC benefit from the standardization of the form factor and this offers various advantages. Support by various board manufactures offers the freedom to choose the best solution. Long-term availability is guaranteed, this ensures that design efforts are secured. Engineers can expect system designs to have the same interfaces because a dedicated set of interfaces is part of the specification. A broad ecosystem of accessories ranging from heat spreaders to cablings and housings makes it easy to purchase components from third parties so that own NRE costs are reduced to the max. As a derivate of a commercial standard, it can deliver lowest component costs for the embedded industries because there is often an option avail-

able that is manufactured in commercial mass production. The fact that a larger community of designers is working with the form factor ensures continuous improvements of the standard. The vendor independent standardization body SGET e.V. helps the community to withstand against proprietary solutions.

These standardization benefits make the eNUC form factor very attractive for many low-power small form factor applications in various embedded and industrial markets for which abundant interface options are provided. The eNUC Type 2 interface is specified for connectivity intensive systems and includes interfaces such as 2x LAN, 2x USB, 1x mini PCI Express and/or mSATA expansion, 2x UART or COM ports and external single power connector as mandatory. Other recommended features include 1x video out (i.e. HDMI, DP, RGB, LVDS internal or external) as well as 1x SATA, 2x additional USB, 1x SD/mSD socket, 1x audio and a minimum product lifetime of 5 years plus support of extended temperature ranges. With all these interfaces packed on a footprint measuring only 4 x 4 inches or 101.6 x 101.6mm, an eNUC board can serve many different applications directly off the shelf, making this rugged form factor instantly field deployable. One of the latest new designs based on this attractive form factor is the eN-GXSOC from Datakamp

with the second generation AMD Embedded G-Series SoC (System-on-Chip). Application areas for this board are small form factor systems in multimedia, infotainment and point of sale as well as medical, industrial automation and control. What makes this board so appealing? It is the AMD accelerated processing unit that provides impressive graphics capabilities combined with scalability and flexibility in cost, performance and power. It is also the first real x86 SoC which takes architecture improvements one step further and integrates the I/O controller on the same chip as the APU, making it the ideal fit for applications requiring ultra-low power and small form factor processors – so it seems designed for the eNUC world.

The second generation G-Series SoC (code name Steppe Eagle) that is now becoming available with the new eNUC boards expands upon the capabilities of the AMD embedded G-Series SoC platform, bringing scalable performance, power and price across CPU, GPU, multimedia and I/O controller hardware, lowering integration effort for more cost-efficient designs. Together, the new G-Series processors deliver immersive, graphically rich experiences across a broad range of applications, from entry-level to mainstream gaming, digital signage, imaging, and industrial control. With this processor Datakamp has
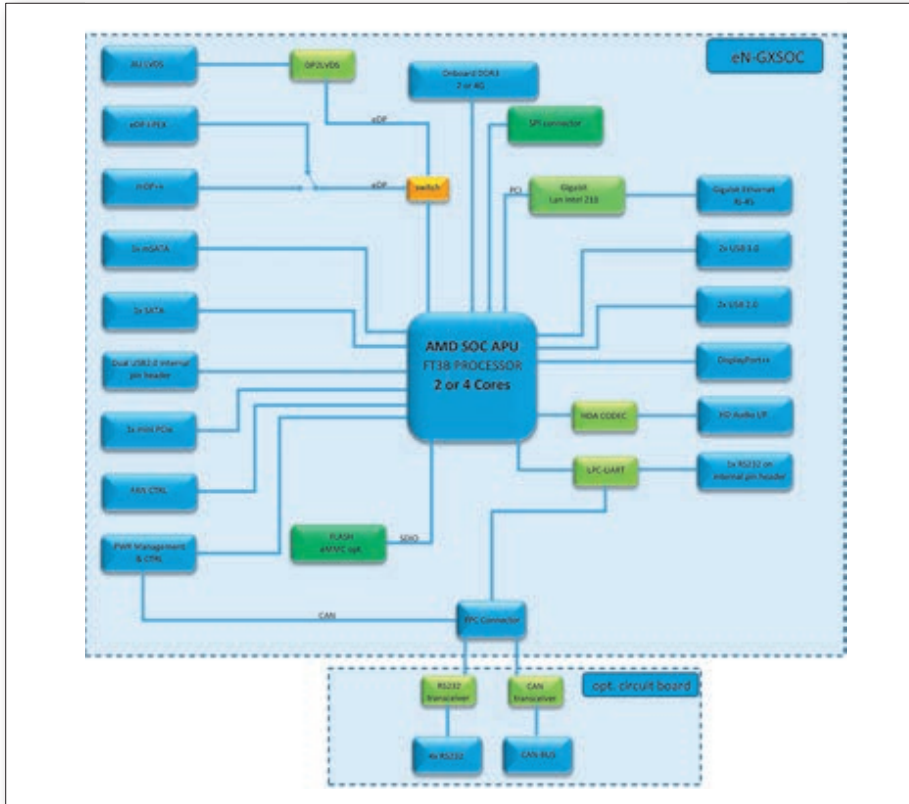
Figure 2. Despite the small form factor, the eNUC eN-GXSOC PC offers a comprehensive set of I/Os.

developed a 4 x 4 inches multimedia engine that supports all features required for graphics intensive applications. Even support for the LED backlight power for the LCD is realized as a modular option. The board further supports embedded DisplayPort via I-PEX for display connectivity, making it highly flexible in terms of supported displays. Depending on the required performance, the boards are highly scalable from the dual-core GX-212JC with 6W up to the quad-core GX-412HC with 7W thermal design power (TDP), trans-

forming them into high-performance, low-power SoC designs with integrated powerful graphics core. They provide the appropriate performance for playing video material in 4K resolution. Even a color depth of 10 bit can easily be activated in the operating system graphics card driver (catalyst). The integrated Radeon graphics supports two independent displays. The connection is established via DisplayPort++, eDP on I-PEX or mDP++ and dual-channel 24-bit LVDS. For generic expansions and IoT connectivity the system

offers 2 x USB 3.0, 4x USB 2.0, an internal mini PCIe slot as well as 1x Gigabit Ethernet. Storage media can be connected via 1x mSATA and 1x SATA. Besides the standard RS232 port, an extension board offers the option to add 4x RS232 as well as CAN bus. High Definition Audio rounds off the feature set. According to the eNUC specification, the eN-GXSOC provides a single power connector for a wide-range power supply from 12 to 36 VDC.

The all-in-one eNUC board has been designed and developed for 24/7 use in harsh industrial environments. It utilizes an innovative passive cooling system that transfers the thermal power directly to the housing and ensures real long lifecycles of the board and the overall system. Reliable and fast SSD mass storage in the form of mSATA or eMMC devices also avoids any moving parts in the system. The RAM memory is furthermore soldered directly to the SBC, increasing shock and vibration resistance and making it even suitable for in-vehicle applications. Supported operating systems include Microsoft Windows and Linux, especially embedded YOCTO Linux.

As the eN-GXSOC is entirely manufactured in Germany, customers can rely on high quality production including tests of each single unit, ensuring that massive field deployments can be executed without any trouble due to board failures. Its EMS partner Ihlemann AG guarantees high-end quality printed circuit board assembly. The board is available as a commercial off-the-shelf product or in tailor-made variants in line with customer special requirements. The development and engineering of hard- and software components can be drawn on as an individual performance or as a project. ∎