

THE WHOLE AMD WORLD ON 95 X 95 MILLIMETERS

Wide choice, extensive ecosystem, attractive roadmap

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Celebrating its 50th anniversary year, semiconductor manufacturer AMD is in an excellent position. For some applications, AMD delivers not just similar performance for less money, but also significantly more performance than the competition. Kontron's embedded selection of the powerful "Zen" micro-architecture offers the entire AMD world on the 95 x 95 millimeter COM Express Compact form factor – including a promising roadmap for future generations.

CONVINCING ALL-ROUND

AMD's high-performance x86 Core "Zen" architecture provides 52% more instructions per clock cycle and a 200% throughput/clock improvement on the GPU over the previous AMD Core generation, the AMD Embedded R-Series. Spanning a wide range of performance classes, from low-power 12-watt dual-core processors to the 100-watt server class with 16 cores/32 threads, AMD offers huge scalability with a single microprocessor architecture. The AMD Ryzen V1000 processors, and the AMD R1000 processors launched in April, are particularly interesting for the classic embedded computing sector. Compared to the AMD R-Series SoC, they offer three times the performance per watt and four times the performance per euro compared to the competition. AMD Epic Embedded 3000 server-class processors for network, storage and industrial applications at the IIoT edge, which are also based on the "Zen" CPU architecture, will be added in the future.

ATTRACTIVE ROADMAP

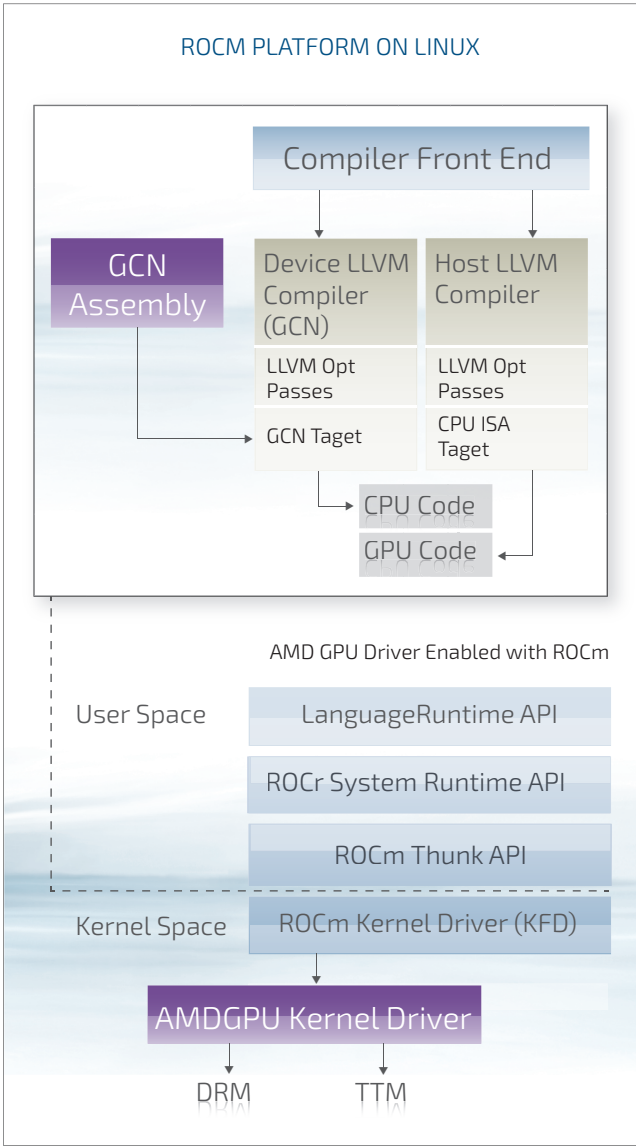
Future generations of the respective processor classes are expected to deliver more performance still. For example, Dr. Lisa Su announced in her latest Computex keynote that the instructions per cycle will increase by up to yet another 15% with the new "Zen 2" architecture, only this time with a smaller 7nm manufacturing process. According to AMD, this performance increase will far exceed the trend of previous performance increases – indicating that previous switches to smaller manufacturing processes were not as impressive. Other aspects to be considered in connection with this first statement about the performance increase include likely performance-per-watt improvements as a result of the smaller manufacturing process, plus probable support of more cores per watt. The larger cache and the new floating point engine design should also have a positive effect on performance.

LONGEST AVAILABILITY IN THE EMBEDDED SECTOR

Next to the strong competitive position in the current performance range and the attractive roadmap for the future, AMD also offers excellent long-term availability, as proven, for example, by the AMD Geode processors, which will be available to embedded computing customers until 2021, a total of 16 years. This makes Geode the longest available processor that is still used in embedded applications today – at least when considering the processor lines of the two leading x86 manufacturers. Ultimately, AMD is offering its customers the benefits of a long-term partnership – something that is very important for embedded projects. Last but not least, long-term availability also acts as a great ROI multiplier, because for every year without design changes, there is a reflow of money into the company coffers.

CPU AND (GP)GPU FROM A SINGLE SOURCE

The company further occupies an outstanding position in the graphics sector, which in today's embedded sector is not only important to deliver impressive UHD graphics for professional gaming, infotainment and HMIs. OEMs can also use the SoC-integrated Vega GPUs for image processing, replacing inefficient, antiquated system architectures based on older ASIC, DSP and FPGA processors with a highly integrated SoC solution that has the added benefit of offering extremely broad hardware as well as software scalability. Inference systems for artificial intelligence (AI) are another major application field. They are increasingly being used in a wide variety of embedded applications, for example to support doctors more efficiently in medical imaging processes or to ensure situational awareness of collaborative robots or autonomous logistics vehicles.

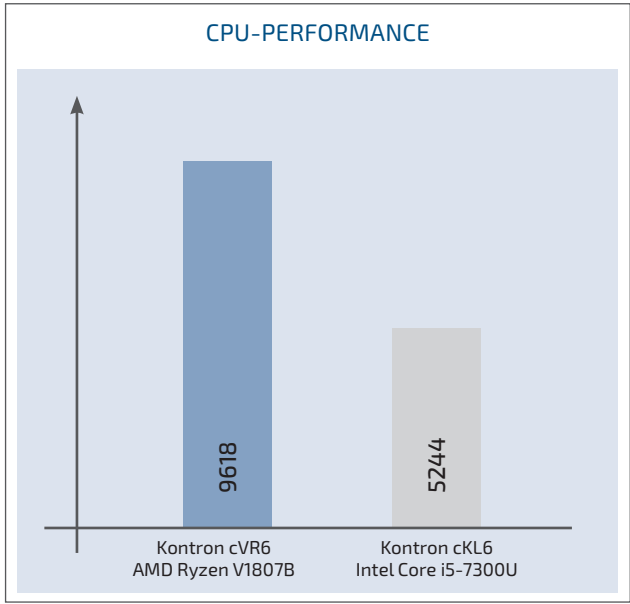


// AMD offers an extensive ecosystem for image recognition and AI, with the trusted open source approach of Radeon Open Compute Platform (ROCm) providing particularly significant advantages. Together with the machine intelligence library MIOpen and machine learning frameworks like TensorFlow, it ensures both long-term availability and backdoor protection.

So there are many reasons to use AMD embedded processor technology as a premium embedded computing solution that can benefit OEMs in all areas – from classic real-time industrial computing, where single thread/single core performance per watt still plays a critical role because the PLC application itself is not as complex, to multicore edge systems with real-time control and virtualized machines for AI integration, Industry 4.0 connectivity and OEM cloud connectivity.

CLEAR PERFORMANCE COMPARISON

With performance always also influenced by the system manufacturer, it is of course ideal to be able to compare the performance measurements for different solutions from the same manufacturer. For this reason, Kontron has put all modules of its COM Express Compact family to the test on the same carrier board. The figures derived for CPU performance, 2D and 3D graphics performance, memory performance and power consumption clearly speak in favor of the “Zen” microarchitecture processors. Such a benchmark setup with Computer-on-Modules is certainly one of the most objective methods, since in alternative tests with motherboards the numerous additional and often different controllers would significantly skew the power consumption values. With Kontron using the same carrier board for all modules, the reliability of the measured values is ensured.



To cut to the chase: The most powerful COM Express Compact module from Kontron today is based on the AMD Ryzen V1000 processors. It not only impresses with exorbitant 3D performance, for which AMD SoCs have always been known, but also delivers the highest CPU performance. The Kontron cVR6 with AMD Ryzen V1807B processor achieved a CPU benchmark score of 9618 points. This is around 83% more computing power than the highest performing COM Express Compact module with Intel Core technology, i.e. the Kontron cKL6 with Intel Core i7 processor 7600U. To find a comparable CPU performance, customers previously had to resort to the much larger COM Express Basic module with Intel Core i7 processor 7820EQ. Admittedly, Intel has followed suit with the 8th generation of Intel Core processors and it is to be expected that the new Kontron COMe-cWL6 will achieve adequate performance. But at what price? Besides, neither reaches the GPGPU computing performance of the integrated AMD Vega graphics unit, which achieves up to 3.6 TFLOPS.

COM EXPRESS COMPACT CPU BENCHMARK

AMD Ryzen V1807-8	9618				Kontron cVR6 with AMD Ryzen V1000
AMD Ryzen V1807-0	8806				
AMD Ryzen V1756-0	8496				
AMD Ryzen V1605-4	7023				
AMD Ryzen V1605-0	6367				
AMD Ryzen V1202-0	4697				
Intel Core i7-7600U	5244				Kontron cKL6 with Intel Core technology
Intel Core i7-6600U	5223				
Intel Core i5-7300U	5154				
Intel Core i5-6300U	4724				
Intel Core i3-6100U	3732				
Intel Core i3-7100U	3667				
Intel Pentium 3965U	2353				

COM EXPRESS COMPACT 3D-GRAPHICS PERFORMANCE

AMD Ryzen V1807-8	1897				Kontron cVR6 with AMD Ryzen V1000
AMD Ryzen V1807-0	1440				
AMD Ryzen V1756-0	1163				
AMD Ryzen V1605-0	866				
AMD Ryzen V1605-4	884				
AMD Ryzen V1202-0	602				
Intel Core i5-7300U	977				Kontron cKL6 with Intel Core technology
Intel Core i7-6600U	923				
Intel Core i5-6300U	875				
Intel Core i7-7600U	862				
Intel Core i3-7100U	782				
Intel Core i3-6100U	745				
Intel Pentium 3965U	457				

FAR SUPERIOR GRAPHICS PERFORMANCE

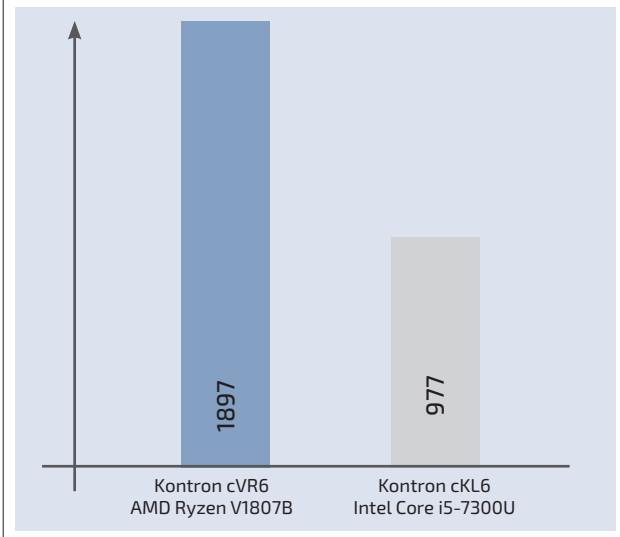
The AMD Ryzen V1000 Series also offers a significant advantage in terms of graphics performance. Featuring an AMD Vega graphics unit, the SoC achieves a 3D benchmark score of up to 1897 points. That's 94% more than the next most powerful Intel-based Compact module, the Kontron cKL6, achieves. OEMs only get comparable graphics performance from the Intel side with the Kontron bSL6 COM Express Basic module, featuring the Intel Xeon E3-1515M processor and Intel Iris Pro Graphics P580 with 128 MB dedicated eDRAM cache. However, with a price of USD 489 as listed by Intel ARK, this processor belongs to a completely different league.

MORE PERFORMANCE THAN TDP

It also goes without saying that more performance comes at a price. For example, the TDP values cited by manufacturers don't reflect the actual power draw. This is also confirmed by the Kontron benchmarks. Despite AMD specifying a TDP of between 35 to 56 watts for the V1807B, the Kontron cVR6 recorded an average of only 29.2 watts in the performance tests. While this is about 59% more than the Kontron cKL6 with Intel Core technology, it also delivers – as described above – a significantly higher overall performance of 88.5% (average of CPU and graphics performance).

So for developers looking for the highest CPU and/or graphics performance in a compact form factor, the Kontron cVR6 with AMD Ryzen Embedded V1000 Series is the first choice. In addition, it is also one of the few high-performance Computer-on-Modules that is available in versions for the extended temperature range of -40°C to +85°C. This makes it not only ideal for medical applications, but also for sophisticated AI applications in robotics, automation, test and measurement and the autonomous vehicle sector. Its excellent price-performance ratio also makes it the first choice for cost-sensitive markets such as digital signage and gaming.

3D-GRAPHICS PERFORMANCE



COM EXPRESS COMPACT OVERALL PERFORMANCE

AMD Ryzen V1807-8	2159				Kontron cVR6 mit AMD Ryzen V1000
AMD Ryzen V1807-0	1951				
AMD Ryzen V1756-0	1796				
AMD Ryzen V1605-4	1643				
AMD Ryzen V1605-0	1583				
AMD Ryzen V1202-0	1293				
Intel Core i5-7300U	1946				Kontron cKL6 mit Intel Core technology
Intel Core i7-6600U	1912				
Intel Core i7-7600U	1826				
Intel Core i5-6300U	1745				
Intel Core i3-6100U	1404				
Intel Core i3-7100U	1400				
Intel Pentium 3965U	1010				

IOT CONNECTIVITY IS KEY

Next to performance, performance per watt and performance per euro scores, the possibilities provided by IIoT connection are currently also playing an essential role. In addition to investigating the purely technical ways of bringing devices into the cloud, OEMs are increasingly focusing on the goal, as this is where considerations always start. What benefits does IIoT connection bring? Once the benefits have been specified in the functional description, the next step is to ask which partner can help implement the benefits most efficiently. The AMD "Zen" microarchitecture includes many features that offer advantages over previous generations in this respect.

NUMEROUS HARDWARE-BASED SECURITY FUNCTIONS

For instance: Thanks to integrated AMD Secure Root-of-Trust Technology, only authorized software can be executed; AMD Secure Run Technology encrypts data in main memory and provides cryptographic isolation from other virtual machines (VMs), clients and even the hypervisor itself; and AMD Secure Move Technology also enables secure migration of VMs. What is more, the Epyc platforms make it possible to apply comprehensive server-grade features to embedded systems as well. This simplifies out-of-band management and makes the reliability, availability, serviceability and manageability (RAS/M) features of high-availability data centers also standard for embedded edge systems. In addition, the Embedded V1000 family offers a one-time programmable (OTP) feature that allows customers to manage their own encryption keys.

SECURE DOWN TO THE BOARD LEVEL

By combining these hardware-integrated features with the offerings of embedded computing vendors such as Kontron, who provide comprehensive software protection, licensing, and monetization capabilities, the key embedded hardware features needed for new business models such as pay-per-use or feature-based licensing with appropriate subscription services are already in place. For example, the new COM Express modules from Kontron integrate the APPROTECT security solution. It includes an optional security chip from Wibu-Systems and a software framework specially developed for this chip.

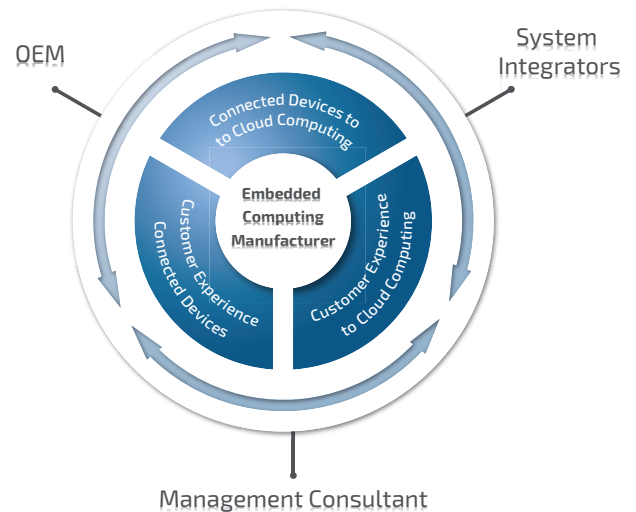
SECURE ACCESS VIA CLOUD INTEGRATION

Implementation of Microsoft Azure Machine Learning and Microsoft Cognitive Services analysis applications is also offered. As a Microsoft Azure partner, the S&T Group, to which Kontron belongs, has the required level of cloud computing expertise and comprehensive know-how in business process integration with ERP systems thanks to SAP S/4HANA Cloud partner status. Even turnkey solutions

with agile billing systems for flexible subscription management, such as those provided by Zuora, should not pose major hurdles for IT specialists. Kontron further offers solutions via S&T's IIoT Software Framework SUSiEtec, for example to provide SCADA functionalities via the cloud. This ensures secure access to machine data from practically any end device.

ENGINEERING PARTNER FOR CHANGE MANAGEMENT

Having completed pretty much all the necessary homework, the embedded computing manufacturer is in a position to seamlessly support change management processes on the technology side. OEMs, system integrators and management consulting service providers can all rely on Kontron as an engineering partner who is able to fully support their business process change efforts, even down to new management systems. In addition to comprehensive hardware know-how – as demonstrated by the in-house benchmarks described earlier – the company's expertise and offering goes considerably beyond that of almost all other classic embedded computing suppliers, who are still largely hardware-driven and don't provide the entire package that OEMs actually need today.



// If OEMs have a clear goal that they want to achieve with IIoT connectivity, they choose their partners differently than if they only think about how to get their data into the cloud.

I <https://www.amd.com/de/technologies/zen-core>

II Testing done at AMD Embedded Software Engineering Lab on 3/13/2019. The AMD R-series Embedded SOC RX-216GD formerly codenamed as "Merlin Falcon" scored 118 and the AMD R-series R1606G scored 361, when running Cinebench® R15 benchmark (Rendering Multi-core preset, 1920x1080x32 resolution). The performance delta of 3x was calculated based on "Merlin Falcon's" performance score of 118 and R1606G performance score of 361. System Configurations: AMD Embedded R-Series RX-216GD used AMD "Bettong" Platform, with 2x8GB DDR4-2400 RAM, 250GB SSD Drive (non-rotating), TDP 15W, STAPM Enabled and ECC Disabled, Graphics Driver 18.50.190214a-339560C-AES, BIOS RPD130CB. The AMD Ryzen Embedded V-Series R1606G used an AMD R1000 Platform with 2x8GB DDR4 2400 RAM, 250GB SSD Drive (non-rotating), TDP 15W, STAPM enabled and ECC Disabled, Graphics Driver 18.50.190207a-339028E-AES, BIOS RBB1190B. Both systems ran Microsoft Windows 10.0 Professional (x64) Build 17763. EMB-158.

III <https://www.amd.com/en/press-releases/2019-05-26-amd-announces-next-generation-leadership-products-computex-2019-keynote>

IV <https://www.amd.com/de/technologies/zen-core>

About Kontron – Member of the S&T Group

Kontron is a global leader in IoT/Embedded Computing Technology (ECT). As a part of technology group S&T, Kontron, together with its sister company S&T Technologies, offers a combined portfolio of secure hardware, middleware and services for Internet of Things (IoT) and Industry 4.0 applications. With its standard products and tailor-made solutions based on highly reliable state-of-the-art embedded technologies, Kontron provides secure and innovative applications for a variety of industries. As a result, customers benefit from accelerated time-to-market, reduced total cost of ownership, product longevity and the best fully integrated applications overall.

For more information, please visit: www.kontron.com



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