

Product Brief: AMD Embedded R-Series SOC

Excellent Processing Performance and Low Power Consumption to Meet Exacting Thermal Requirements

Product Overview

The AMD Embedded R-Series SOC (formerly codenamed “Merlin Falcon”) delivers astonishing graphics and HD multimedia processing performance – with true 4K decode and encode – via a sophisticated SOC architecture that integrates up to four of AMD’s latest high-performance “Excavator” x86 CPU cores with the AMD Radeon™ graphics and an I/O controller all on a single die. Building on AMD’s established leadership in high-end graphics, the AMD Embedded R-Series SOC is the highest performance AMD embedded processor to-date, outperforming select competing processors by more than 50% when running industry-standard graphics benchmarks.¹

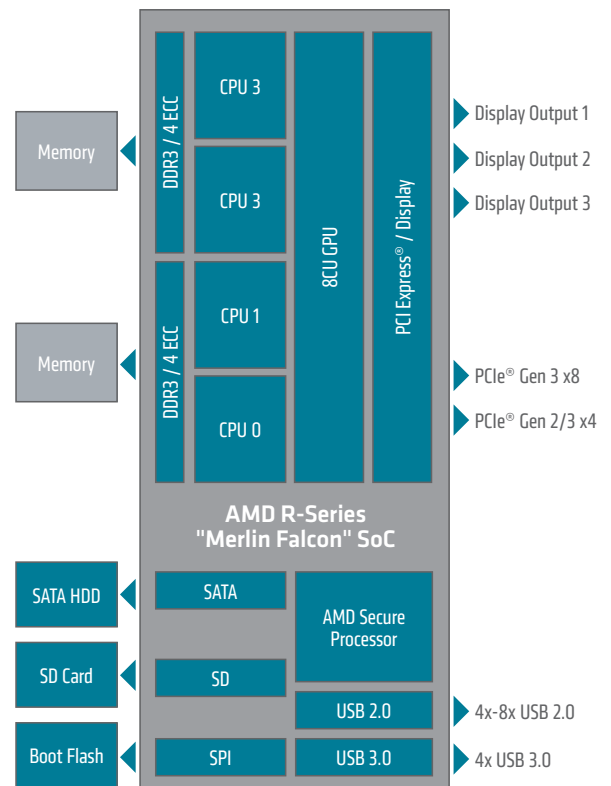
For compute-intensive workloads and complex algorithm processing, the AMD Embedded R-Series SOC enables system designers to leverage the benefits of 1.0-compliant Heterogeneous System Architecture (HSA) technology to boost parallel processing performance to new heights. These performance attributes are complemented with dynamic power management capabilities and other key benefits, which, together, distinguish the AMD Embedded R-Series SOC as an ideal fit for the most exacting embedded applications, spanning electronic gaming machines, medical imaging, interactive digital signage, media storage, communications/networking, and beyond.

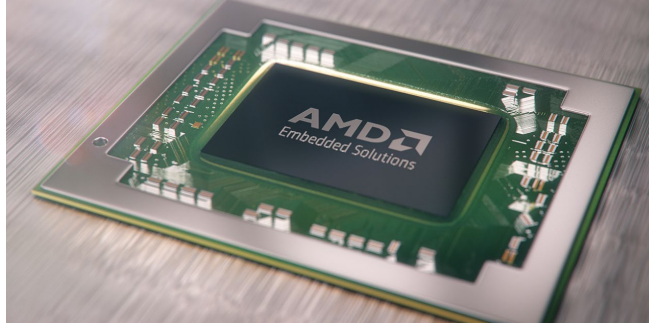
Built for Speed

The integration of AMD Radeon™ graphics via the third-generation Graphics Core Next (GCN) architecture enables the AMD Embedded R-Series SOC to deliver up to 58% more graphics performance than the Intel Core i7-5650U based on the 3DMark® 11 (Performance) benchmark¹, and 22% more graphics performance than the previous generation AMD Embedded R-Series RX-427BB processor based on the 3DMark 11 (Performance) benchmark.² For parallel processing applications, HSA technology balances workloads between the CPU and GPU allowing for optimal processing performance, reducing latencies and maximizing access to 2MB of shared L2 cache memory using Heterogeneous Uniform Memory Access (hUMA) technology.

Additionally, the AMD Embedded R-Series SOC can deliver up to 25% more CPU-intensive performance than the 2nd Generation AMD Embedded R-Series APU based on compute-intensive industry standard performance benchmarks.³

AMD Embedded R-Series SOC





Advanced Multimedia and Display Features

The AMD Embedded R-Series SOC enables stunning video performance, providing true 4K encode and decode and integrated support for DirectX® 12, Unified Video Decode (UVD) 6 (4K H.265⁴ and H.264 decode) and Video Coding Engine (VCE) 3.1 (4K H.264 encode). Up to three displays are supported with options to use the Embedded DisplayPort (eDP) 1.4, DisplayPort (DP) 1.2, Digital Video Interface (DVI) or HDMI™ 1.4/2.0 interfaces.

Power, Temperature and Design Versatility

The AMD Embedded R-Series SOC features a configurable thermal design power (cTDP) capability that enables a programmable TDP range from 12W to 35W, giving system designers the flexibility to tune power consumption and thermal profiles to meet their unique requirements. Standard 0°C to 90°C and, for the first time on an R-Series device, industrial -40°C to 105°C temperature (iTemp) processors are offered. Ideally suited for small form factor systems, the AMD Embedded R-Series SOC occupies a 35% smaller footprint than second-generation AMD Embedded R-Series APUs.⁵

Additional Key Benefits

- AMD's first embedded processor with dual-channel 64-bit DDR4 or DDR3 with Error-Correction Code (ECC), with speeds up to DDR4-2400 and DDR3-2133, and support for 1.2V DDR4 and 1.5V/1.35V DDR3
- Dedicated AMD Secure Processor supports secure boot with AMD Hardware Validated Boot (HVB); initiates trusted boot environment before starting x86 cores
- High-performance Integrated FCH featuring PCIe® Gen3 USB3.0, SATA3, SD, GPIO, SPI, I2S, I2C, UART

Model Number	OPN	cTDP Range	Radeon™ Branding	# x86 Cores	L2 Cache (Mbytes)	CPU Clock GHz (15W Base)	CPU Clock GHz (Max)	# GPU Compute Units	GPU Clock MHz (Max)	Max DDR3 Rate	Max DDR4 Rate	Operating Temp Range Tj °C
RX-421BD	RE421BAAY43KA	12-35W	R7	4	2	2.1	3.4	8	800	2133	2400	0°C to 90°C
RX-418GD	RE418GAAY43KA	12-35W	R6	4	2	1.8	3.2	6	800	2133	2400	0°C to 90°C
RX-216GD	RE216GAAY23KA	12-15W	R5	2	1	1.6	3.0	4	800	1600	1600	0°C to 90°C
RX-421ND	RE421NAAY43KA	12-35W	-	4	2	2.1	3.4	-	-	2133	2400	0°C to 90°C
RX-216TD	RE216TAAY23KA	12-15W	-	2	1	1.6	3.0	-	-	1600	1600	0°C to 90°C
RX-416GD	RE416GATY43KA	15W	R6	4	2	1.6	2.4	6	576	1600	1600	-40°C to 105°C

For more information about the specific features and specifications supported by select products in AMD's solutions portfolio, or to learn more about AMD Ryzen™ Embedded R-Series SOC Processor Family, visit www.amd.com/r-series

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1. The AMD RX-421BD processor (configured for 15W TDP) scored 2190 and the Intel Core i7-5650U (15W) scored 1384. The score for the RX-421BD (2.1 GHz base, 3.4 GHz boost) was measured using an AMD Gardenia motherboard with 8GB of DDR3-2133 memory, a 250GB Samsung EVO 850 solid state drive (SSD), and graphics driver 15.101.0.0. The score for the Core i7-5650U (2.2 GHz) was measured using a Congatec TC97 module with 8GB of DDR3-1600 memory, a 250GB Samsung EVO 850 solid state drive (SSD), and graphics driver 10.18.14.4139. Both systems running Windows 8.1 Professional. EMB-134
2. Comparison is based on the 3DMark11 (Performance) benchmark score of both products. The AMD RX-421BD (35W) processor scored 2720; the RX-427BB (35W) scored 2235. The score for the RX-421BD (2.1 GHz base, 3.4 GHz boost) was measured using an AMD Gardenia motherboard with 8GB of DDR3-2133 memory, a 250GB Samsung EVO 850 solid state drive (SSD), and graphics driver 15.101.0.0. The score for the RX-427BB (2.7 GHz base, 3.6 GHz boost) was measured using an AMD Ballina motherboard with 8GB of DDR3-2133 SO-DIMM memory, a Hitachi 256GB HDD, and graphics driver 13.350.0.0. Both systems ran Windows® 8.1 Professional. EMB-133
3. Comparison is based on performance measured using the EEMBC CoreMark v1.0 MT benchmark. The AMD RX-421BD (35W) processor scored 65693; the RX-427BB (35W) scored 52662. The score for the RX-421BD (2.1 GHz base, 3.4 GHz boost) was measured using an AMD Gardenia motherboard with 8GB of DDR3-2133 memory, a 250GB Samsung EVO 850 solid state drive (SSD) and graphics driver 15.101.0.0. The score for the RX-427BB (2.7 GHz base, 3.6 GHz boost) was measured using an AMD Ballina motherboard with 8GB of DDR3-2133 SO-DIMM memory, a Hitachi 256GB HDD and graphics driver 13.350.0.0. Both systems ran Windows® 8.1 Professional. EMB-137
4. HEVC acceleration is subject to inclusion/installation of compatible HEVC players. GD-81
5. Merlin Falcon = 1073mm². Bald Eagle + Chipset = 928mm² + 600.25mm² = 1528.25mm². Difference = 455.25mm² or 35%

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