

Product Brief: AMD Ryzen™ Embedded V1000 Processor Family

Ultra-High-Performance Graphics and Compute Processing with Advanced Security Features in a Seamlessly Integrated Single-Chip Solution

Product Overview

The AMD Ryzen™ Embedded V1000 processor family brings together the breakthrough performance of the pioneering AMD “Zen” CPU and “Vega” GPU architectures in a seamlessly-integrated SoC solution that sets a new standard in processing power for next-generation embedded designs. Delivering superior graphics and multimedia processing, and compute performance up to 3.6 TFLOPS with thermal design power (TDP) as low as 12W and as high as 54W, AMD Ryzen™ Embedded V1000 SoCs equip system designers to achieve new levels of processing efficiency and design versatility. With an innovative set of advanced, integrated security features, AMD Ryzen™ Embedded V1000 SoCs enable sophisticated system safeguards complemented by an expansive breadth of I/O interconnect options.

The AMD Ryzen™ Embedded V1000 simplifies the design, form factor and thermal management challenges inherent to discrete CPU and GPU configurations, enabling system designers targeting digital casino gaming, medical displays, thin clients, industrial PCs and other applications to easily and elegantly scale their graphics and compute performance for advanced, feature-rich system designs. A single, small-footprint AMD Ryzen™ Embedded V1000 SoC powers up to four independent displays in brilliant 4K resolution, delivering stunningly rich and immersive visual experiences. An industrial temperature processor option is also available that can operate in temperatures as low as -40°C.

Outstanding Performance for Wide Applications

4C/8T

“Zen” Cores
14nm

UP TO
3.6

TFLOPS³

4

4K Displays

4K

Video Decode or
Encode¹

Dual

10GE

Leading Edge
Security
SME

Scalability

12W – 54W

New Levels of Graphics and Compute Performance

AMD Ryzen™ Embedded V1000 SoCs provide an ultra-high-performance complement to the AMD Embedded R-Series and G-Series SoC portfolios, delivering up to a 52% IPC boost at the CPU² and up to a 107% improvement in GPU performance⁴.

compared to the prior generation. Up to 4 CPU cores/8 threads and 11 GPU compute units can be harnessed to achieve breakthrough processing throughput for the most demanding graphics and compute workloads.

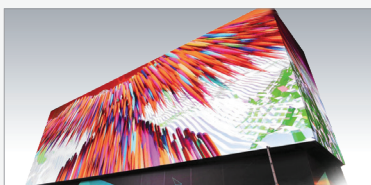
Markets

Gaming Machines



Casino Gaming, Arcade Gaming, Over the top set-top box gaming

Digital Signage



Digital Signage, Pos/kiosk, Quick Service Restaurant

Medical Imaging



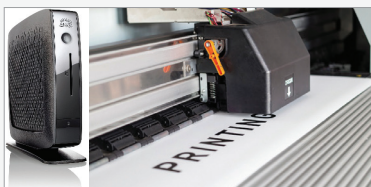
Portable Medical Equipment, Clinical Workstation, MRI, Xray, CT

Industrial Controls & Automation



Industrial HMI/PC, Machine Vision, Surveillance, Smart Server/Gateway

Thin Client & Office Automation



Financial/Education, Converged Devices, Printing & Imaging

Communications Infrastructure



Enterprise/Switch/Router, Service Provider Networking, IoT infrastructure

Seamless Integration

Integrating a high-performance CPU and GPU on a single die, the AMD Ryzen™ Embedded V1000 SoC enables significant space savings, smaller board designs and more efficient cooling architectures than can be achieved with heterogeneous CPU and GPU chipsets – with attendant CAPEX and OPEX savings

opportunities. New hardware support for VP9 10-bit decode and H.265 10-bit decoding and 8-bit encoding¹. Robust I/O support spans new and established embedded interconnects spanning PCIe®, Ethernet, and USB.

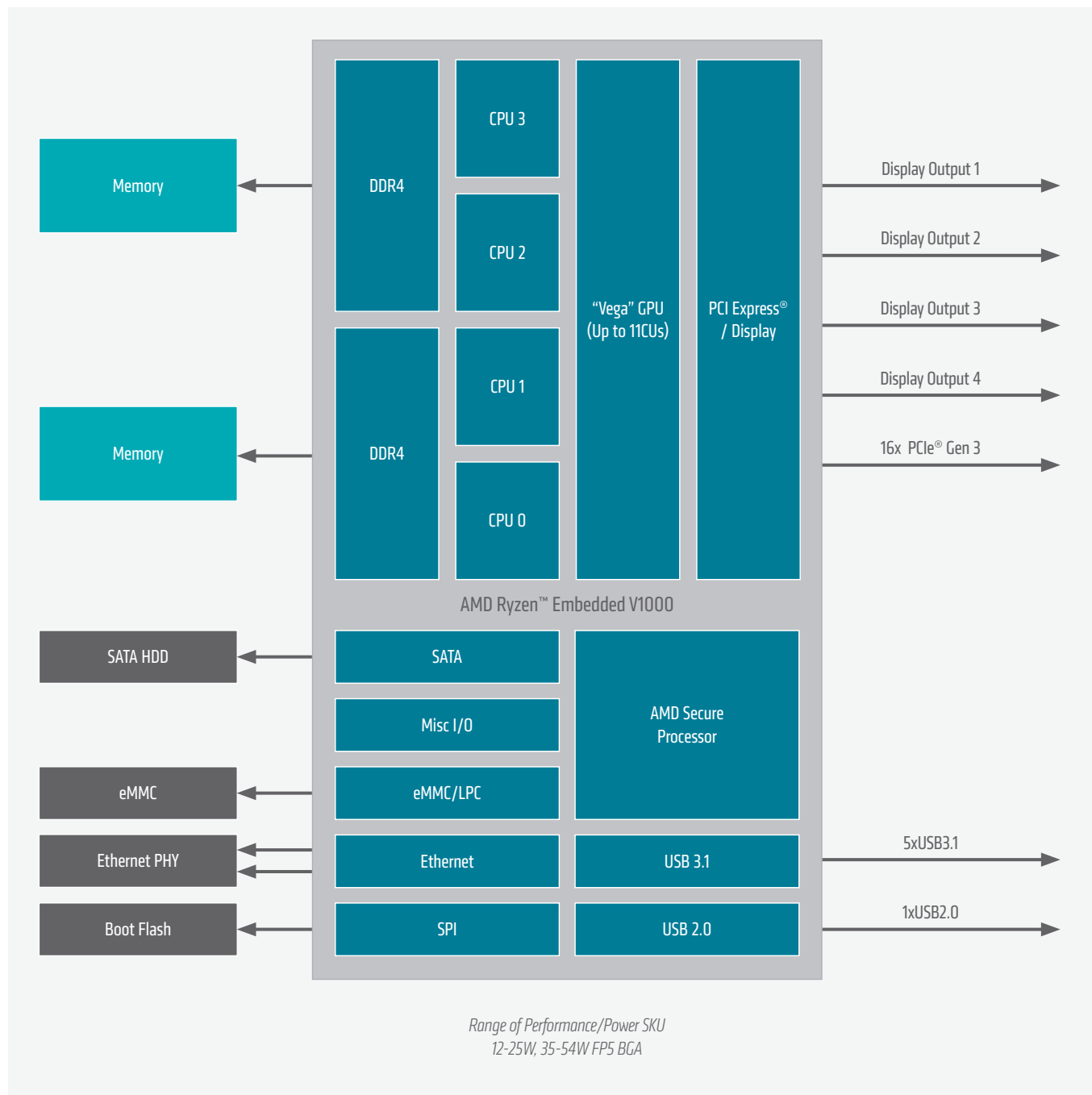
Uncompromising Security Features

AMD Ryzen™ Embedded V1000 SoCs leverage an onboard AMD Secure Processor for Crypto Co-processing that encrypts data before it feeds to the I/O, complemented with Platform Secure Boot capabilities to help ensure systems are booted from trusted

software, with one-time programmable (OTP) capabilities enabling system designers to manage their own keys. Advanced capabilities include Secure Memory Encryption (SME) for helping defend against unauthorized memory access.

Additional Key Benefits

- AMD Ryzen™ Embedded V1000 SoCs can power up to four independent displays in crisp 4K resolution via DisplayPort™ / eDP and/or HDMI™, and support for High Dynamic Range (HDR) displays.
- Equipped with dual-channel 64-bit DDR4 with performance up to 3200 MT/s, AMD Ryzen™ Embedded V1000 SoCs provide up to 16 PCIe lanes, dual Ethernet, up to four USB 3.1 Gen 2 interconnects, with additional USB, SATA and NVMe support.
- Planned product availability extends up to 10 years, providing customers with a long-lifecycle support roadmap.
- An industrial temperature processor option is offered (V1404I), with a temperature range of -40°C to 105°C.



Performance

x86 “Zen” Core

- Up to four cores / eight threads with up to 2MB of shared L2 plus 4MB of shared L3 total

Dual-channel 64-bit DDR4 Up to 3200 MT/s

- ECC support
- 1 DIMM / channel (Dual-Rank on FP5 32GB total)

Security

AMD Secure Processor (PSP)

- fTPM2.0, crypto-offload, Platform Secure Boot, integrated DRM
- Field Programmable Keys
- SME Secure Memory Support

Integration

Graphics Core and Multimedia

- “Vega” GPU with up to 11 Compute Units
- H.265 (10-bit) Decode & (8-bit) Encode, (10-bit) VP9 Decode¹
- Up to 4x DisplayPort™ 1.4, HDMI™ 2.0b, or eDP 1.4

Enhanced I/O (FP5)

- Up to 4x USB 3.1 (10Gb/s) / 2x Type-C® with ALT. DP power delivery capable
- 1x USB 3.1 (5Gb/s)
- 1x USB 2.0
- Up to 2x SATA ports
- NVMe support
- eMMC5.0, SD3, or LPC
- Up to 16L of PCIe® Gen3 (8 lane GFX, 8 lane GPP) and 7 link max
- 2x 10 Gigabit Ethernet
- 2x UART, 4x I2C, 2x SMBus, SPI/eSPI, I2S/HDA/SW, GPIO

Model	TDP Range	CPU Core/Thread Count	Base Freq. GHz	1T Boost Freq. GHz (up to)	Graphics Computing Units (SIMD)	GPU Freq. GHz (up to)	Individual Displays	L2 Cache	Package	Max DDR4 Rate (MT/s) (up to)	Dual Ethernet Ports	Junction Temperature Range (°C)
V1807B	35-54W ^a	4/8	3.35	3.8	11	1.3	4	2M	FP5	3200	10Gb	0 - 105
V1780B	35-54W ^a	4/8	3.35	3.6	0	NA	0	2M	FP5	3200	10Gb	0 - 105
V1756B	35-54W ^a	4/8	3.25	3.6	8	1.1	4	2M	FP5	3200	10Gb	0 - 105
V1605B	12-25W ^b	4/8	2.0	3.6	8	1.1	4	2M	FP5	2400	10Gb	0 - 105
V1500B	16W ^c	4/8	2.2	NA	0	NA	0	2M	FP5	2400	10Gb	0 - 105
V1404I	12-25W ^b	4/8	2.0	3.6	8	1.1	4	2M	FP5	2400	10Gb	-40 - 105
V1202B	12-25W ^b	2/4	2.3	3.2	3	1.0	4	1M	FP5	2400	1Gb	0 - 105

a. Nominal TDP = 45W

b. Nominal TDP = 15W

c. Nominal TDP = 16W

For more information about the specific features and specifications supported by select products in AMD's solutions portfolio, or to learn more about AMD's Ryzen™ Embedded V1000 Processor Family, visit www.amd.com/ryzenembedded-v-series-1000.

AMD.com/embedded

1. HEVC (H.265), H.264, and VP9 acceleration are subject to and not operable without inclusion/installation of compatible HEVC players. GD-81

2. Updated Feb 28, 2017: Generational IPC uplift for the “Zen” architecture vs. “Piledriver” architecture is +52% with an estimated SPECint_base2006 score compiled with GCC 4.6 -02 at a fixed 3.4GHz. Generational IPC uplift for the “Zen” architecture vs. “Excavator” architecture is +64% as measured with Cinebench R15 1T, and also +64% with an estimated SPECint_base2006 score compiled with GCC 4.6 -02, at a fixed 3.4GHz. System configs: AMD reference motherboard(s), AMD Radeon™ R9 290X GPU, 8GB DDR4-2667 (“Zen”)/8GB DDR3-2133 (“Excavator”)/8GB DDR3-1866 (“Piledriver”), Ubuntu Linux 16.x (SPECint_base2006 estimate) and Windows® 10 x64 RS1 (Cinebench R15). SPECint_base2006 estimates: “Zen” vs. “Piledriver” (31.5 vs. 20.7 | +52%), “Zen” vs. “Excavator” (31.5 vs. 19.2 | +64%). Cinebench R15 1T scores: “Zen” vs. “Piledriver” (139 vs. 79 both at 3.4G | +76%), “Zen” vs. “Excavator” (160 vs. 97.5 both at 4.0G | +64%). GD-108

3. The equation makes assumptions for clock and uses 16-bit floating point operands. FLOPS = 11 CU * 4 SIMD/CU * 4Shaders/SIMD * 4 MAC/Pixel * 4 FLOPS/Cycle/ALU * 1300MHz = 3.661 TFLOPS. EMB-151.

4. Testing performed at AMD Embedded Software Engineering Labs as of 12 January 2018. The AMD R-series Embedded SOC RX-421BD formerly codenamed as “Merlin Falcon” scored 2399 and the AMD Ryzen Embedded V-series V1807B scored 4978, when running 3dMark® 11P benchmark. The performance delta of 107% was calculated based on “Merlin Falcon” performance score of 2399 and V1807B's performance score of 4978. AMD Embedded R-Series RX-421BD used AMD “Bettong” Platform, with 2x8GB DDR4-2400 RAM, 250GB SSD Drive (non-rotating), TDP 35W, STAPM and ECC Disabled, Graphics Driver 17.40.2011-171026a-320350C-AES, BIOS RBE1306A. The AMD Ryzen Embedded V-Series V1807B used an AMD “Dibbler” Platform with 2x8GB DDR4 3200 RAM, 250GB SSD Drive (non-rotating), TDP 35W, STAPM and ECC Disabled, Graphics Driver 17.40-171114a-320676E-AES-2-wRV-E9171, BIOS TDB1100EA. Both systems ran Microsoft Windows® 10 Pro. EMB-143