

Product Brief: AMD EPYC™ Embedded 3000 Family

Breakthrough Performance, Dependability and Security Features for the Next Generation of Networking, Storage and Industrial Computing Infrastructure

Product Overview

AMD EPYC™ Embedded 3000 processors expand the AMD EPYC™ Embedded family of products to harness the breakthrough performance benefits of the “Zen” CPU architecture, bringing exceptional reliability, availability and serviceability features to networking, storage and industrial applications. Leveraging major advancements in I/O integration, flexibility, and security capabilities, AMD EPYC™ Embedded 3000 processors set a new benchmark for innovation giving system designers a compelling and cost-effective new choice in x86 embedded processing.

With expansive integrated I/O, true Simultaneous Multithreading (SMT), comprehensive built-in security features, and a scalability pathway from AMD EPYC™ Embedded 3000 to data center-class AMD EPYC™ Embedded 7001 processors, system designers can meet and even surpass their ambitious design goals for next-generation network function virtualization (NFV), software defined networking (SDN), networked storage infrastructure, and a wide range of industrial applications.

Outstanding Performance for Wide Applications

16 16, 12, 8, 4
cores per socket

Wide range of core counts satisfying various industry needs



Up to 64 PCIe®
Gen3 lanes

Large I/O capacity



Up to 8 10GbE
Ethernet

Industry leading Ethernet connectivity



Up to 4 Memory channels
per CPU

Outstanding memory bandwidth



Up to 1TB RAM
per socket

Rich memory density

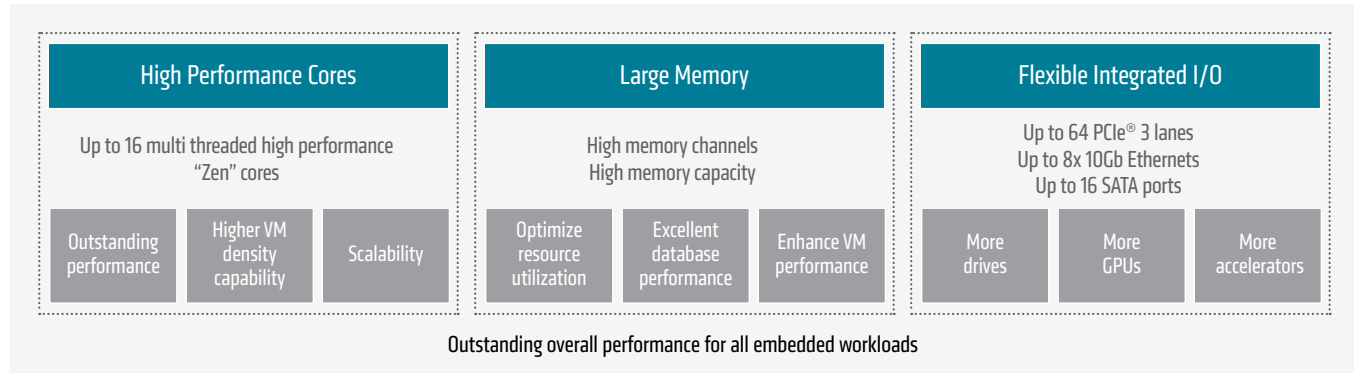


A New Benchmark for Performance

AMD EPYC™ Embedded 3000 processors leverage AMD's advanced "Zen" architecture and 14nm FinFET process to deliver up to a 52% improvement in instructions per clock (IPC) compared to legacy architectures¹. System designers can

exploit high-speed single-thread processing performance and/or multithread processing leveraging up to 16 cores to accelerate throughput for their unique application requirements.

Enhance Performance

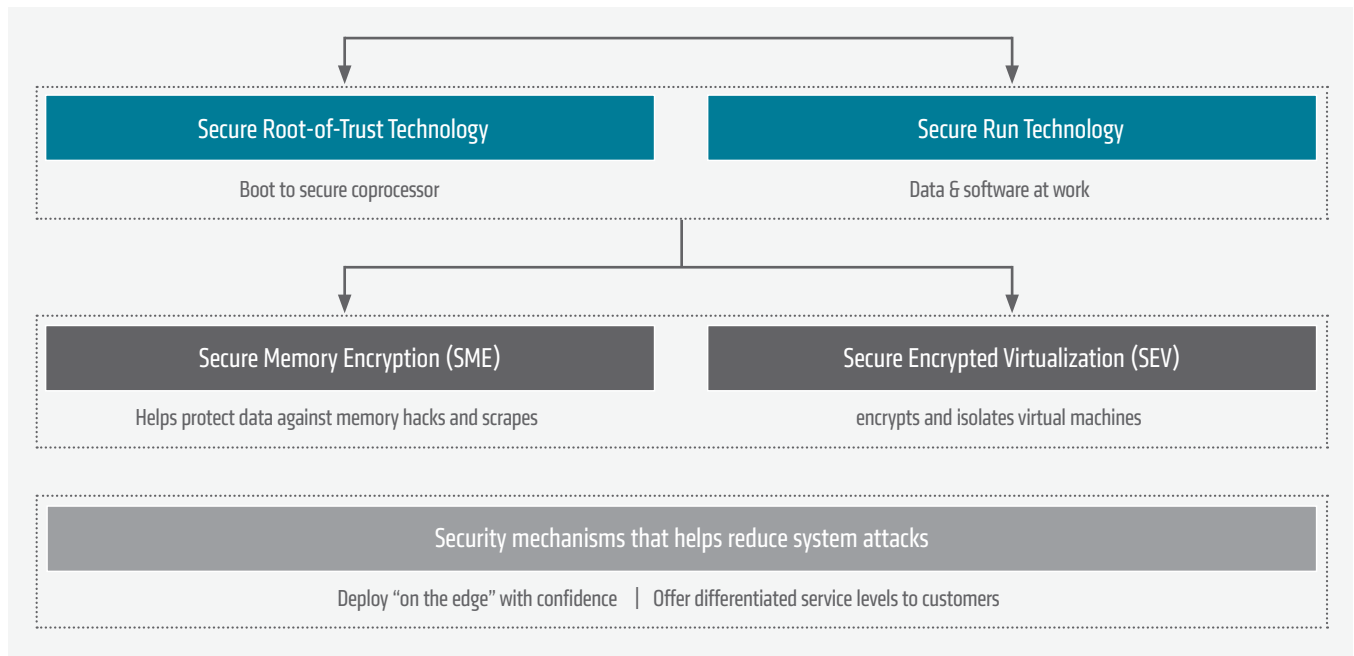


Advanced Security Features

AMD EPYC™ Embedded 3000 processors feature an onboard AMD Secure Processor that encrypts data before it feeds to the I/O, complemented with Hardware Validated Boot capabilities to help ensure systems are booted from trusted software, with one-time programmable (OTP) capabilities enabling

system designers' unique configuration. Advanced capabilities include Secure Memory Encryption (SME) for helping defend against unauthorized memory access, and Secure Encrypted Virtualization (SEV) for helping isolate hypervisors and virtual machines (VMs) – with no application code changes required.

Lock from Boot Up to Shut Down



Enterprise-Class Data Integrity

AMD EPYC™ Embedded 3000 processors provides world class, enterprise-class reliability, availability² and serviceability features to provide error detection, correction, recovery and containment, helping ensure high data integrity for the most stringent applications. The availability features in AMD EPYC™ Embedded

processors are designed so applications can stay online and accessible to users even in the presence of uncorrectable errors. Enhanced serviceability features address the need to enable servicing to happen at preplanned times, accelerating troubleshooting and helping reduce downtime.

RAS Features Summary

Reliability

- Low-SER FinFET Transistors
- Parity and error-tolerant devices throughout core
- Caches
 - L1 data cache with SEC-DED ECC
 - L1 data tag / L1 instruction cache with parity + retry
 - L2 / L3 caches with DEC-TED ECC
- DRAM
 - DRAM ECC with Chipkill capabilities
 - DRAM Address/Command Parity with Replay
 - DRAM Write Data CRC with Replay
- CRC protection of core CC6 state
- Parity on all internal data buses
- Link Packet CRC with Retry
- Sync Flood on uncontainable errors
- PCIe® Advanced Error Recovery (AER)
- PCIe® Downstream Port Containment (DPC)

Availability

- Machine Check Recovery on uncorrectable errors
- Error Thresholding for Predictive Failure Analysis
- NVDIMM support
- Watchdog timers
- Core disable
- PCIe® Non-Transparent Bridging (NTB)

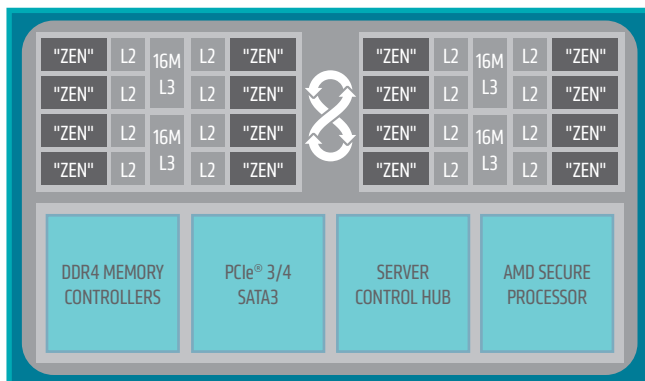
Serviceability

- Machine Check Architecture Extensions (MCAX)
 - Scalable MCA
 - First Error Diagnosability
 - DOER/SEER architecture
- DDR4 Post Package Repair (boot time)
- Platform First Error Handling
- APLM SB-RMI, notification on errors
- L2, L3, and DRAM scrubbers
- DRAM Error Injection

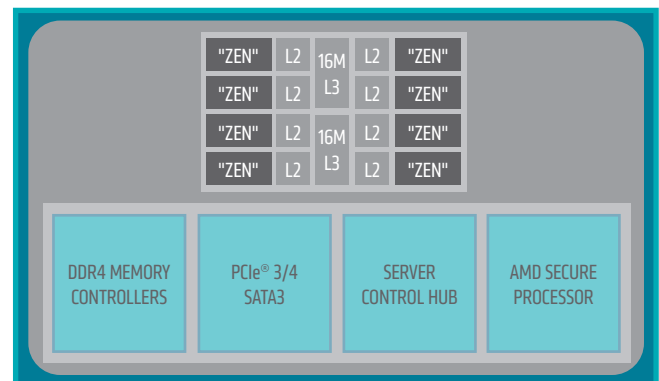
Additional Key Benefits

- Single-thread and multithread processing agility spans from 4 to 16 core configurations, with TDPs ranging from 30W to 55W (1 die, up to 8 cores), and 65W to 100W (2 dies, up to 16 cores).
- Provides up to 64 PCIe® lanes in 2 die configurations, with up to 8 channels of 10 GbE, and up to 32MB shared L3 cache with up to 4 independent memory channels.
- Integrated eight 10Gb ethernet ports provide seamless support for IPv4 and IPv6 security protocols, with integrated crypto acceleration supporting the IPsec protocol.
- Up to 64 lanes of PCIe® connectivity in the 2 die configurations, which can be configured as 16 lanes of SATA connectivity enable expanded support for NVMe and SATA-connected storage devices.
- Ideally suited for rugged applications in industrial segments via industrial extended temperature support options and a robust BGA package with pin-compatibility options from 4 to 16 cores to enable multiple rugged designs with one design footprint.
- Extended product availability provides customers with a long-lifecycle support roadmap.

SP4 MCM



SP4r2 SCM



SP4 MCM

Model #	OPN	Cores	Threads	TDP* (W)	Base Freq (Ghz)	All Cores Boost Freq (Ghz)	Max. Boost Freq (Ghz)	L3 \$ (MB)	DDR Channels	Max DDR Freq (1DPC)	PCIe®	Tj (C)
3451	PE3451BMQGAAF	16	32	80-100 ¹	2.15	2.45	3.00	32	4	2666	x64	0 to 105 ²
3351	PE3351BNQCAAF	12	24	60-80 ¹	1.90	2.75	3.00	32	4	2666	x64	0 to 105 ²

SP4r2 SCM

Model #	OPN	Cores	Threads	TDP* (W)	Base Freq (Ghz)	All Cores Boost Freq (Ghz)	Max. Boost Freq (Ghz)	L3 \$ (MB)	DDR Channels	Max DDR Freq (1DPC)	PCIe®	Tj (C)
3255	PE3255BGR88AF	8	16	30-55 ¹	2.50 ²	3.10	2.50	16	2	2666	x32	-40 - 105
3251	PE3251BGR88AF	8	16	55	2.50	3.10	2.50	16	2	2666	x32	0 - 105
3201	PE3201BHR88AF	8	8	30	1.50	3.10	1.50	16	2	2133	x32	0 - 95
3151	PE3151BJR48AF	4	8	45	2.70	2.90	2.70	16	2	2666	x32	0 - 95
3101	PE3101BIR4KAF	4	4	35	2.10	2.90	2.10	8	2	2666	x32	0 - 95

1. Configurable TDP
2. 85C T_{JA} (Local ambient temperature)

Target Applications



Networking

- Highly parallelized CPU ideal for Network Function Virtualization (NFV) and Software Defined Network (SDN)
- Security features for business critical network data
- HW encrypted multi-tenant security
- High I/O for network connectivity
- Memory capacity for large traffic datasets



Industrial

- High integer and floating point capacity
- Enterprise level RAS (Reliability, Accessibility and Serviceability) help to maximize uptime
- Flexible stack to minimize the solution development and deployment
- Security features for business critical data



Storage

- Direct SATA & NVMe support
- High parallelism for low latency
- More memory for larger cache
- High I/O bandwidth for fast data loading
- Memory encryption to help secure data

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 EPYC™ Embedded 3000 Family, visit www.amd.com/epycembedded

AMD.com/embedded

1. 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

2. Extended availability applies to AM4 based AMD Embedded products and assures that all such products will be available for purchase through December 2022 for final shipment dates through June 2023. EMB-162