SMC 2000 Smart Memory Controllers

SMC 2000 16×32G

SMC 2000 8×32G

Summary

SMC 2000 Smart Memory Controllers are the industry's best-in-class Compute Express Link™ (CXL)™ Type 3 memory controller. The SMC 2000 series meets the growing memory bandwidth and capacity demands of data center workloads. These controllers expand DDR memory bandwidth and capacity to overcome the limitations of traditional parallel DDR interface to meet increasing computational demands of next-generation CPUs and GPUs.

The SMC 2000 series of Smart Memory Controllers supports the CXL 1.1 and CXL 2.0 specifications utilizing CXL.mem sub-protocol for low-latency memory expansion and CXL.io sub-protocol for management. SMC 2000 controllers provide media independence, a reduction in Total Cost of Ownership (TCO) and a significant increase in low-latency DRAM memory bandwidth and capacity per CPU/GPU core. Take advantage of DDR4 and DDR5 support, industry-leading Reliability, Availability and Serviceability (RAS), enhanced security and telemetry. By allowing modern CPUs to optimize application workloads, you can have a lower total overall cost in your data center.

Typical applications for the SMC 2000 family include Artificial Intelligence (AI), Machine Learning (ML), High-Performance Computing (HPC) and other applications that require increased number of memory channels to deliver more memory bandwidth and capacity.

Highlights and Benefits

- High-performance, low-latency DRAM bandwidth and capacity expansion
- High-reliability CXL with robust error containment, end-to-end data integrity protection and ECC protection on internal and external memories
- Industry-leading security with Root of Trust (RoT), secure boot, secure firmware update, secure debug, firmware encryption and attestation features

CXL Features

- CXL 1.1- and CXL 2.0-capable Type 3 memory controller
- Up to 1×16 32 Gbps CXL (PM8702 SMC 2000 16×32G)
- Up to 1×8 32 Gbps CXL (PM8701 SMC 2000 8×32G)
- Common clock (with/without SSC) and separate clock (SRIS/SRNS)
- CXL interleaving support of 1/2/4/8-way with granularity from 256B to 16 KB
- L0 (normal) and L1 low-power control state
- SLD support with up to 16 logical devices
- Device-level reset pin (RSTB) and CXL port-level reset (PERST)
- Up to 512B Max Payload Size (MPS)

DDR Features

- 2 DDR controllers with DDR4 and DDR5 support
- 2× 40-bit DDR5 interface or 1× 72-bit DDR4 interface per DDR controller
- Up to 4H 3DS stack per DDR controller
- Up to 4 logical ranks per DDR controller
- Support for ×4, ×8 DRAM devices

Reliability, Availability and Serviceability (RAS)

- End-to-end data path integrity with overlapping parity/ECC
- Industry-leading ECC support for DDR
- Chip kill support
- Programmable patrol scrub
- DRAM memory initialization at boot
- Transparency mode/ECS
- Refresh Management (RFM) for row hammer mitigation
- Post package repair (sPPR and hPPR)
- Programmable memory BIST
- Thermal performance throttling

Diagnostics

- CXL and DDR performance monitors
- CXL and DDR error counters
- CXL and DDR error injection
- CXL and DDR trace
- LTSSM log and triggers
- Ordered Set Analyzer
- Firmware logs, crash dump and event records

Security

- Secure boot
- Secure firmware update
- Secure debug
- Device personalization/certificates
- Attestation
- Key management
- Firmware encryption

Package

- 19 mm × 19 mm package for SMC 2000 8×32G
- 25mm × 25 mm package for SMC 2000 16×32G

Peripheral Support

- Support for SPI, I^3C/ I^2C, GPIO, UART and JTAG/EJTAG

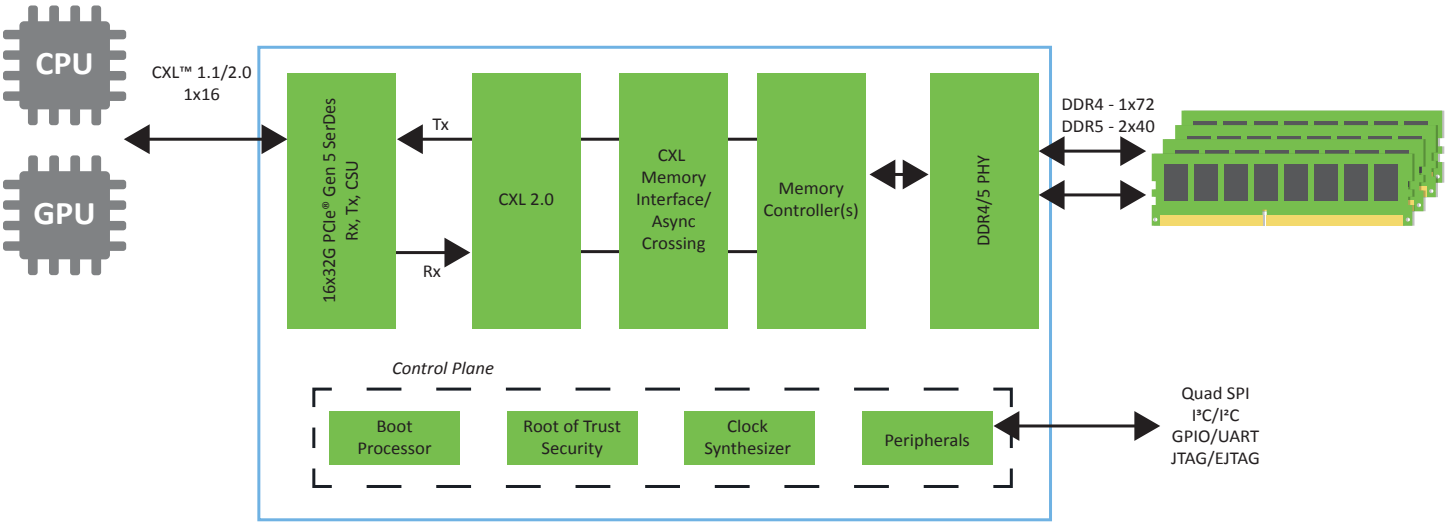
Evaluation Kit

- The PM8702_DDR4 evaluation board is a CXL ×16 full height full-height, full-length add-in card with 2× DDR4 DIMM supporting a single DPC
- The PM8702_DDR5 evaluation board is a CXL ×16 full-height, full-length add-in card with 2× DDR5 DIMM supporting a single DPC
- These evaluation kits support I^2C/SMBus interface, on-board USB-to-UART converter with USB cable and EJTAG/JTAG connector for debugging purposes

DDR Configurations and Supported Form Factors

- Support for up to 2 DPC RDIMMs or 1 DPC UDIMM per DDR5 controller
- Support for up to 2 DPC RDIMMs or 1 DPC UDIMM per DDR4 controller
- Quad-rank support per DDR4/5 controller for RDIMM configurations and planar with RCD configurations
- Dual-rank support per DDR4/5 controller for UDIMM configurations and planar without RCD configurations
- Form factors supported include:
  - Add-in card with DIMMs
  - Mezzanine card with DIMMs
  - EDSSF – E1.S/ E1.L, E3.S/E3.L

High-Level Block Diagram



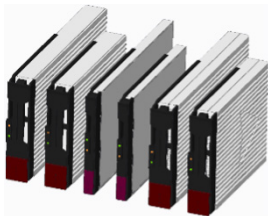
Product	Part Numbers	CXL Specification	CXL Lanes	CXL Speed	DDR Channels	Package Sizes
SMC 2000 16x32G	PM8702A-F3EIP	CXL 1.1/2.0	x16 (max)/x8/x4	32G (max)	Dual 1x72-bit DDR4 Dual 2x40 bit DDR5	25mm × 25mm
SMC 2000 8x32G	PM8701A-F3EIP	CXL 1.1/2.0	x8 (max)/x4	32G (max)	Single 1x72 bit DDR4 Single 2x40-bit DDR5	19mm × 19mm

Targeted Use Cases

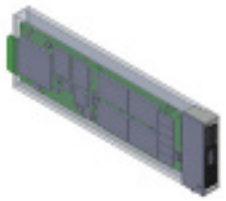
SMC 2000 Smart Memory Controllers are targeted for a number of performance and computationally intensive use cases that require high memory bandwidth and capacity. These applications include hyperscale applications such as Artificial Intelligence (AI), Machine Learning (ML), off-the-shelf CXL DRAM-based EDSSF drives and cost-effective, high-bandwidth memory applications in servers and storage products for data centers.

AI/Machine Learning

Data Centers



EDSSF E3.S Drives



EDSSF E1.S Drives