SiliconMotion



SM2524XT

High-Performance, Power-Efficient PCIe Gen5 x4 NVMe 2.1 SSD Controller

As next-generation edge computing applications, including AI PCs, demand higher throughput, lower latency, and greater storage scalability, the need for advanced, power-efficient SSD storage solutions continues to accelerate. Designed to meet these evolving requirements, the SM2524XT delivers an optimal balance of performance, power efficiency, and architectural scalability for next-generation PCIe Gen5 SSDs.

Built on a proven architecture and compliant with PCIe Gen5 x4 and NVMe 2.1 specifications, the SM2524XT supports the latest high-layer 3D TLC and QLC NAND technologies. It enables high-throughput performance while maintaining excellent power efficiency, making it ideal for capacity-oriented and AI-driven storage applications.

Superior Performance for Edge Computing and AI PC Devices

Built on TSMC's advanced 6nm process technology, the SM2524XT SSD controller features a high-performance quad-core Arm® Cortex-R8® CPU architecture and supports a PCIe Gen5 x4 interface with 32GT/s per lane. It includes four NAND channels operating at up to 4,800 MT/s, delivering exceptional performance for mainstream TLC and QLC NAND-based SSDs.

The SM2524XT is also equipped with an optimized system architecture and supports the Host Memory Buffer (HMB) feature, making it an ideal solution for DRAM-less SSD applications that require a balance of high performance, low power consumption, and cost efficiency.

With its advanced architecture, the SM2524XT ensures superior performance while maintaining excellent power efficiency. It delivers up to 14 GB/s sequential read and write speeds, along with up to 2.5M IOPS random read and write performance, enabling fast and consistent responsiveness for demanding workloads.

Advanced Architecture with SCA (Separate Command Address) Acceleration

The SM2524XT incorporates Separate Command Address (SCA) technology, enabling parallel command and data processing to improve NAND interface efficiency and reduce latency. It enhances overall data throughput and accelerates sequential performance for next-generation edge SSD applications, including AI PCs.
Built with an optimized internal data path and enhanced SRAM architecture, the controller improves buffering efficiency and data flow management, delivering lower latency and more consistent performance under mixed workloads.

NANDXtend® ECC Technology with Advanced 4K+ LDPC Engine

The SM2524XT integrates Silicon Motion's proprietary NANDXtend® ECC technology, featuring an advanced 4K+ LDPC engine and end-to-end data path protection. Optimized for high-density 3D TLC and QLC NAND, this ECC architecture ensures maximum data integrity and extended SSD endurance throughout the NAND lifecycle. Through advanced firmware algorithms and low-power design methodologies, NANDXtend® technology delivers enhanced correction efficiency and reliability, maintaining consistent performance without compromising power consumption.

Intelligent Power Optimization with PI-LTT Technology

The controller incorporates PI-LTT technology to dynamically optimize NAND I/O behavior, significantly reducing NAND interface power consumption while maintaining high performance. This enables more efficient operation under sequential and mixed workloads, improving overall system-level power efficiency.

Combined with intelligent power management and next-generation NAND support, the SM2524XT delivers higher performance without proportional increases in power consumption, improving overall system-level efficiency.

KEY FEATURES

- **High Performance**
  - PCIe Gen5 x4
  - 4 NAND channels up to 4,800 MT/s
  - Quad-core ARM Cortex-R8® CPU
- **Advanced Architecture**
  - Separate Command Address (SCA) technology
  - Optimized SRAM architecture
- **Data Integrity and Reliability**
  - NANDXtend® ECC technology
  - Advanced LDPC engine
  - End-to-end data path protection
  - Internal data integrity mechanisms
- **Best Power Efficiency**
  - PI-LTT intelligent power optimization
  - Low power consumption design

SPECIFICATIONS

	SM2524XT
Host Interface	**PCIe Gen5 x4**
PCIe Protocol	**NVMe 2.1**
Processor	**Quad-core ARM Cortex-R8® CPU**
Channel/CE	**4CH / 16CE**
Max Performance	**Sequential Read: 14 GB/s** **Sequential Write: 14 GB/s** **Random Read: 2.5M IOPS** **Random Write: 2.5M IOPS**
NAND Flash Support	**ONFI 5.2 and Toggle 6.0** **Data rate up to 4,800 MT/s**
Security	**Real time full drive encryption with AES 128/256** **TCG Opal 2.0 compliant** **Hardware SHA 256/384/512 and TRNG** **Secure Boot for FW authentication**
Advanced Features	**SMBus, I3C, I²C, SPI supported**
Package	**252-ball FCCSP-C (11.6 mm x 6.8mm)**

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