# Flashtec® NVMe® 5016

## Performance 16-Channel Gen 5 PCIe® Flash Controller



### Summary

The Flashtec® fifth generation NVMe controller family enables the world's leading enterprises and data centers to realize the highest performance PCIe Gen-5 SSDs utilizing next-generation NAND technologies. Combining world-class capacity, security and flexibility, the Flashtec controller family is the reliable choice. The Flashtec NVMe 5016 controller supports the standard NVM Express (NVMe) host interface and is optimized for high-performance random read/write operations, performing all Flash management operations on-chip and consuming negligible host processing and memory resources.


### Flexibility

The flexible and programmable platform gives developers total control for NVMe SSD optimization to meet the most demanding workloads in traditional and AI-accelerated servers in the data center, from Cloud computing and business-critical applications, such as online transaction processing, financial data processing, database mining and other applications that are sensitive to latency and performance, as well as AI-focused applications designed for fast, large data movement for maximum usage of compute resources.

### Power-optimized Performance

NVMe 5016 is optimized for power savings, utilizing a combination of architectural and semiconductor design techniques to deliver a performance of more than 2.5 GB of data per Watt, and 3.5 M IO's per second for highest PCIe Gen-5 performance. Emphasis is given to absolute power consumption and to advanced power management features, including the automatic idlingof processor cores and autonomous power reduction capabilities. The NVMe 5016 controller leverages the Enterprise NVM Express dynamic power management interface, enabling solutions to meet power and performance objectives through firmware for all design goals.

### Error Correction

Flashtec's advanced ECC engine provides superior endurance and increases the overall reliability of today's SSD technologies and NAND geometries. The advanced Flashtec LDPC correction technology utilizes both hard and soft decode techniques, to extend memory life with exceptionally strong Error Correction capabilities for QLC NAND and future technologies.

### TCO

The NVMe 5016 flexibility, power optimization and scalability reduce the total cost of owenrship with advanced virtualization capabiities like single root I/O virtualization (SRIOV), multiple physical functions and multiple virtual functions per physical function, for maximum utlization of PCIe resources. The programmable controller supports Flexible Data Placement (FDP) for maximum performance, efficiency and reliability of Flash resources on the SSD.

### Cloud Optimizations

The advanced virtualization coupled with the new Credit Engine for dynamic allocation of resources enables optimal on-demand cloud services. High-performance CPU cores, hardware offload engines, and innovative Machine Learning technology enable differentiated solutions for the Cloud and Data Center Storage Market segments.

### Reliability and Security

NVMe 5016 Flashtec controller delivers end-to-end data security, integrity and reliability for enterprise-class solutions from factory to end of life (EOL). Security features include Secure Boot with on-chip hardware Root-of-Trust, dual signature authentication, support for various security standards and authentication algorithms, encryption for data protection in transit and at rest, as well as sophisticated key management techniques. The NVMe 5016 data integrity and reliability is fortified through a combination of exceptionally strong ECC with adaptive LDPC, and failover recovery with RAID.

## Features

- Flashtec NVMe 5016 controller can achieve up to 3.5 million random read IOPS on 4 KB operations
- The Flashtec NVMe 5016 controller bandwidth can achieve 14+ GB/s bandwidth
- PCIe Gen 5 x4 or dual independent PCIe Gen 5 x2 (active, active/standby) host interface, compliant with PCIe 5.0 base specification and NVMe 2.0+ protocol
- Enables multiple form factors including: E3, U.2, U.3, and PCIe add-in cards
- SLC, MLC, Enterprise MLC, TLC and QLC Flash with Toggle and ONFI interface supporting up to 3200 MT/s
- Zoned Namespace (ZNS) capable
- Supports Flexible Data placement (FDP)
- 16 independent Flash channels
- Supports up to four ranks of DDR5-5200
- Industry leading security and encryption, including PCIe lane encryption, Single Chip Hardware Root of Trust and FIPS 140-3 Level 2 compliance
- Data integrity and reliability:
  - Strong LDPC Flash ECC
  - Flash channel RAID
  - End-to-end data protection
- Innovative Machine Learning technology
- Advanced virtualization with multiple physical functions support

## Benefits

- Power-optimized high-performance PCIe Flash controllers for enterprise, hyperscale and AI-focused applications
- Advanced ECC and LDPC enabling current and future architectures of next generation Flash NAND technologies
- Machine Learning engine providing a platform for innovation in SSD management with machine learning technology
- Programmable architecture enables SSD developers to optimize product differentiation through firmware customization, enabling support for latest standards and initiatives, like FDP (Flexible Data Placement)
- Supports a wide range of applications from the industry's highest performance SSDs to higher capacity SSD solutions
- Firmware Reusability: Preserves similar building blocks and programming architecture from previous generations
- Ideal for constructing SSDs compatible with a range of form factor standards, including custom ones to accommodate the unique requirements of diverse storage server configurations
- Supports industry-leading security features such as Single Chip Hardware Root of Trust and FIPS 140-3 Level 2 compliance

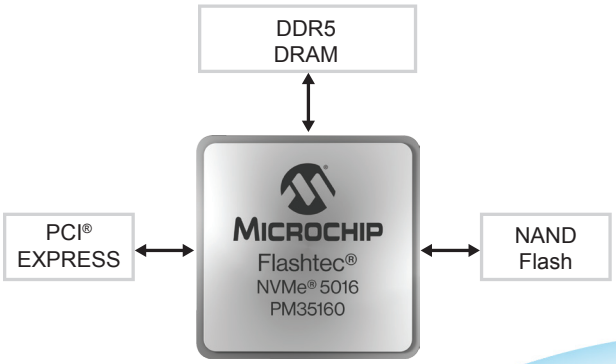
Microchip provides NVMe hardware and software solutions to enterprise and data center customers, enabling world-leading performance, capacity, security and flexibility.

Solid-state drives promise to greatly enhance enterprise and data center storage performance with faster random access to data and faster transfer rates. PCI Express-based SSDs, together with the NVM Express host control, alleviate the interface bottleneck. Microchip's family of NVMe-compliant PCIe enterprise Flash controllers dramatically boost the number of random I/O operations per second that a system can process, while concurrently reducing latency and power.

## Ordering Information

| Part Number | Description | Package |
|---|---|---|
| **PM35160A-F3EIP** | ×4 PCIe® Gen 5 prototype | 23 mm × 23 mm |

## Flashtec Architecture Diagram







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