

# Evaluating SSD Manufacturers: Why NAND Expertise Matters

Micron Technology, Inc.  
Technical Marketing Brief

## Not All SSDs Are Created Equal

As the volume of data and the number of users and connected devices skyrocket, IT professionals across the industry are looking for ways to eliminate latency. Because solid state drives (SSDs) are much faster than hard disk drives (HDDs) in READ and WRITE operations, purchasing SSDs instead of traditional spinning HDDs is one way to optimize application performance. However, it is important to not make the SSD leap too quickly. SSDs aren't all created equal, and performance is just one consideration.

The SSD manufacturer's expertise with the underlying NAND Flash storage media is also an important consideration. Some manufacturers purchase NAND from external suppliers; others—like Micron—manufacture NAND themselves, and therefore, have more NAND Flash storage expertise. Purchasing SSDs from a manufacturer who also creates the underlying NAND storage can translate to measurable technical and business benefits. This technical brief highlights some of those advantages.

## What Is NAND?

NAND is the nonvolatile Flash memory device upon which most SSDs are based. It requires very little energy, and like magnetic media, it retains its memory even without power.



Figure 1: Micron® NAND Flash Memory

## Why Consider a Manufacturer's NAND Flash Expertise?

While almost all SSDs are based on NAND, not all NAND is the same, and NAND is only one part of the overall SSD equation. An SSD manufacturer who owns and builds their own NAND has greater visibility into and control over that equation from the beginning. This end-to-end view enables enforcement of high-quality standards. By contrast, manufacturers who must purchase the NAND for their SSDs merely assemble components that are sourced elsewhere and have limited insight into the test process and supply chain path for the most critical component of the end product.

Furthermore, critical differences exist between SSD manufacturers' memory controller firmware (the bits that manage the NAND), which is just as critical as the NAND media itself. Because of their in-depth expertise with the media, NAND manufacturers can optimize performance, reliability, and endurance by building capabilities into the controller firmware. Manufacturers who assemble purchased components must either buy the controller code or develop it themselves, and they often lack the NAND knowledge required to truly maximize the SSD's capabilities.

## What to Expect From NAND Storage Experts

True NAND experts, like the engineers at Micron, can build monitoring and maintenance capabilities into the controller firmware with deep hooks in the underlying silicon. For example, Micron's enterprise SSDs have custom firmware that monitors the health of the NAND. When the firmware detects excessive wear on memory blocks, it can retire those blocks to avoid performance degradation and data loss. Micron's enterprise SSDs also



implement XPERT enhancements to extend drive life and ensure data integrity. Manufacturers who simply assemble parts purchased from suppliers do not have the deep insight into NAND that's required to code these types of capabilities into the firmware.

## What Does NAND Expertise Mean in Business Terms?

The capabilities and other advantages gained from purchasing SSDs from a NAND manufacturer can result in direct, measurable benefits, including:

- **Cost savings:** Non-NAND manufacturers must purchase their NAND and other components at a marked-up price and then build profit margin for those components into the cost of their SSDs. Purchasing SSDs from NAND experts could save costs associated with markup.
- **Improved efficiency:** Well-managed NAND media enables more effective monitoring of drive use and replacement. For example, as mentioned previously, the custom firmware in Micron's enterprise SSDs can monitor the drive's health and automatically retire worn

memory blocks. This insight can be communicated to the device software and alert the user when a drive is ready to be replaced, enabling a proactive approach to drive management.

- **Predictable pricing:** Non-NAND manufacturers are more exposed to the unpredictability of the NAND supply, making it difficult to control their prices over the lifetime of a product. They could compensate for the uncertainty by building enough margin into their pricing to cover the risk of NAND market fluctuations. Because NAND manufacturers control their own supply of the medium, they aren't subject to the same risks and can offer more consistent pricing.
- **Predictable SSD supply:** NAND experts have extensive end-to-end visibility into the NAND supply chain. This visibility enhances availability and enables business obligations to be met on time. SSD manufacturers who don't own the NAND don't have the same insight and are subject to market conditions that might adversely affect their ability to meet demand.

Most importantly, partnering with a NAND expert like Micron can help create differentiated solutions.

## XPERT Enhancements for Enterprise SSDs

eXtended Performance and Enhanced Reliability Technology (XPERT) is a suite of Micron-designed storage architecture enhancements that greatly improve SSD performance and reliability. XPERT extends drive life and ensures data integrity.

With XPERT, Micron aligns storage media design, SSD firmware development, and hardware integration to create a comprehensive architecture that enables enterprise-class SSDs to meet the unrelenting demands of 24/7/365 data centers.

The XPERT feature set gives us the flexibility to design SSDs to meet exact application requirements. Only the XPERT features that are appropriate to a particular application are designed in, so our SSDs can precisely match data center usage models. From booting general-purpose servers and storing mission-critical databases, to ensuring long-term, trouble-free operation of appliances and managing petabytes of cloud data—XPERT-enabled SSDs meet the stringent usage requirements demanded by the massive growth of digital data.

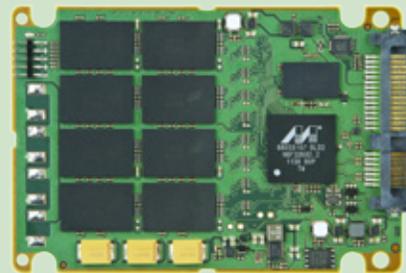


Figure 2: Micron P400m Enterprise SSD (Without Case)



## How Can SSD Manufacturers Help Create Differentiated Solutions?

The enterprise server market is losing its tolerance for latency. Multisocket servers are commodities that use dozens of cores to support hundreds of data-hungry virtual machines. Now 10Gb Ethernet (GbE) switches and server adapters are widespread in the data center with 40GbE and 100GbE technologies available. These technologies are spotlighting data center bottlenecks, and traditional HDDs—with IOPS measured in the hundreds—are under scrutiny. Micron's PCIe SSDs deliver up to 780,000 IOPS, which is exponentially faster than the fastest HDDs.

The IOPS performance of any SSD is impressive in a head-to-head comparison with an HDD. So speed alone isn't enough to differentiate solutions. In order to stand out, next-generation servers and storage devices must also deliver the reliability and manageability that customers demand; and that's where NAND expertise is crucial.

NAND management firmware is becoming increasingly sophisticated as NAND continues to scale. Each NAND manufacturer develops unique proprietary code, which changes often as engineers innovate and learn more about the technology. Third-party manufacturers who merely purchase NAND from suppliers cannot keep up with these changes. Lacking expertise of their own, they must purchase it—in the form of proprietary information encoded in the controller firmware—from NAND originators whom they compete with in the SSD market. This position is risky for these third-party manufacturers; to

mitigate this risk, they must maintain relationships with several NAND manufacturers to ensure access to proprietary knowledge. This combination inhibits third-party manufacturers' ability to deliver benefits that extend beyond raw speed. Their tenuous position could also pose a risk to the consistent quality and pricing of their SSDs.

On the other hand, NAND manufacturers like Micron can tune the NAND and firmware specifically for enterprise use, practically on-the-fly. With Micron SSDs, it's easy to take advantage of our technical expertise. Our NAND management optimization delivers not only incredible performance, but also enterprise-grade SSD insight and manageability for server and storage solutions.

## Learn More

Raw speed is impressive in any SSD, but other factors must be considered before making a purchase decision. One of the most important things to consider is the manufacturer's expertise with the NAND media inside the SSD. SSDs built by manufacturers who also own and create the NAND can provide business and technical benefits beyond manufacturers who merely assemble purchased components. In-depth NAND expertise enables advanced functions such as error correction, management, and reporting, which can help reduce costs, downtime, and data loss. A decision to purchase SSDs from a NAND manufacturer is a strategic choice.

Learn more by visiting [micron.com/ssd](http://micron.com/ssd), or contact us directly at [ssd@micron.com](mailto:ssd@micron.com).

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