

Marvell 88NV9145

Native PCIe Gen 2.0 x 1 NAND Flash Controller



PRODUCT OVERVIEW

The Marvell® 88NV9145 is a native PCIe Gen 2.0 x1 NAND flash controller enabling high-performance, low-latency PCIe SSD adapters used for enterprise data center applications. This product supports four channels of NAND flash devices with up to four Chip Selects per channel. Each Marvell 88NV9145 can support up to 64-gigabyte (GB) single-level cell (SLC) NAND flash memory and up to 128GB MLC NAND flash. Figure 1 shows a reference design with 32GB SLC NAND flash leveraging the Marvell 88NV9145. By combining a low-latency high port count PCIe switch to aggregate multiple Marvell 88NV9145 NAND flash modules, Marvell has developed the world’s highest performance native PCIe solid-state drive (SSD) reference solution. Figure 2 conceptualizes this modular design that offers maximum scalability of SSD performance and capacity. A modular design point also provides flexibility to match different performance, cost, and capacity points to different application market segments (for example, 16-module high-end, 8-module mid-range, 2-module entry-level configurations).

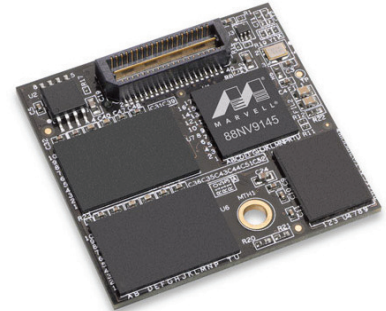


Fig 1. Marvell 88NV9145 in Modular 32GB SSD Reference Design

BLOCK DIAGRAM

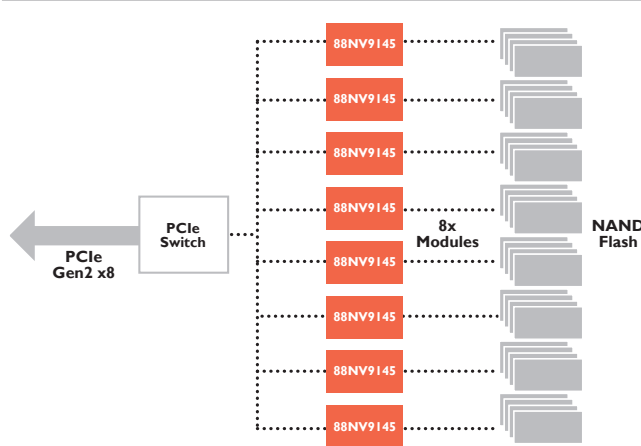


Fig 2. System Block Marvell 88NV9145 Native PCIe SSD Evaluation Board

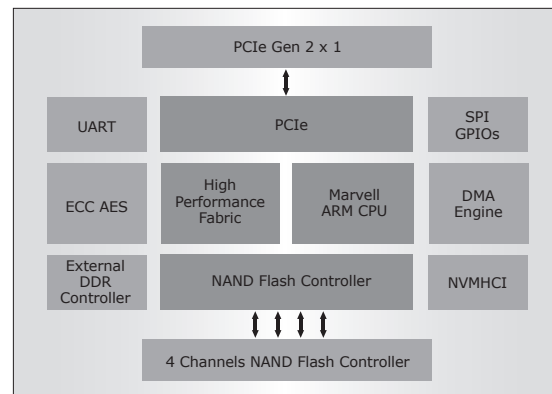


Figure 3: 88NV9145 Block Diagram

FEATURES SPECIFICATIONS

FEATURES	SPECIFICATIONS
<ul style="list-style-type: none"> Native PCIe NAND Flash Controller PCIe 	<ul style="list-style-type: none"> Native PCIe solution eliminates the unnecessary protocol overhead of either SAS or SATA conversion Optimizes for lower latency and higher bandwidth PCIe x Gen 2.0 x1 endpoint (5Gbps) Supports multi-function Function 0 – AHCI Function 1 – Marvell NAND HCI Function 2 – NVMHCI Supports Message Signal Interrupts (MSI) Integrated power management
<ul style="list-style-type: none"> NAND Flash 	<ul style="list-style-type: none"> 8-bit NAND data interface supporting single-level cell (SLC), multi-level cell (MLC) and triple-level cell (TLC) NAND flash memory Supports four channels of NAND flash devices with up to 4 Chip Selects per channel Supports ONFI 2.2 up to mode 5 (100MHz) for ONFI source synchronous mode (200MB/s per channel) ONFI and Toggle mode NAND support
<ul style="list-style-type: none"> Host Drivers 	<ul style="list-style-type: none"> Proprietary Linux Driver Proprietary Windows Driver AHCI Inbox Driver Non-Volatile Memory Host Controller Interface (NVMHCI)
<ul style="list-style-type: none"> Engines and Other Features 	<ul style="list-style-type: none"> Integrated DMA engines Enhance ECC engine Integrated on-chip wear-leveling algorithm Flexible sequencer programming model for optimal performance
<ul style="list-style-type: none"> Processor 	<ul style="list-style-type: none"> Embedded Marvell 88FR321 V5TE CPU Core (ARM946-Compatible) Integrated ITCM and DTCM Integrated 32-bit 16-entry Write Buffer Support JTAG interface

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FEATURES (continued)	SPECIFICATIONS	
<ul style="list-style-type: none"> Peripheral Interface 	<ul style="list-style-type: none"> External DDR/DDR2 Support external SPI flash memory Integrated UART to access device registers 	<ul style="list-style-type: none"> 8-bit GPIO JTAG interface
<ul style="list-style-type: none"> RAID 	<ul style="list-style-type: none"> RAID 0 Volume Manager supported on proprietary Marvell host drivers Provides ability to aggregate multiple 88NV9145 modules into a single volume and optimize performance by load balancing across modules 	
<ul style="list-style-type: none"> Maximum NAND Flash Capacity 	<ul style="list-style-type: none"> 64GB SLC NAND Flash 	<ul style="list-style-type: none"> 128GB MLC NAND Flash
<ul style="list-style-type: none"> I/O Operations Per Second (IOPS) Performance 	<ul style="list-style-type: none"> 93K IOPS 4K Random Reads 	<ul style="list-style-type: none"> 70K IOPS 4K Random Writes
<ul style="list-style-type: none"> Latency 	<ul style="list-style-type: none"> <50 microseconds response time 	

APPLICATIONS

Today, clustered databases, distributed file systems and virtualized application workloads (eg. Virtual Desktop Infrastructure) are increasingly leveraging servers with hyper-threading or multi-core CPUs for computational performance. Advances in processor technology create opportunities for a new performance tier of storage using flash memory to accelerate application performance and break through the storage I/O barrier that is inherent with traditional hard drives. The Marvell 88NV9145 incorporates features to address this emerging market by eliminating storage I/O bottlenecks via the world's highest performing native PCIe SSD solution.

The Marvell native PCIe NAND flash controller is a flexible and powerful solution, enabling maximum IOPS, throughput and NAND flash capacity for enterprise application environments that demand the highest level of performance and reliability. Using a modular approach to scale NAND flash incrementally, Figure 4 shows the random read and random write performance for the 88NV9145.

4k Random Read		4k Random Write (clean drive)	
1 Module	93 k	1 Module	70 k
2 Modules	186 k	2 Modules	140 k
4 Modules	371 k	4 Modules	277 k
8 Modules	730 k	8 Modules	530 k
16 Modules	1.4 Million	16 Modules	1.04 Million

Fig 4: IOPS (Input/Output Operations Per Second) Performance – 1 to 16 Marvell 88NV9145 modules

This product is available for qualified customers with standard evaluation board, Linux development kit and user manual. Please contact your local Marvell sales team for inquiries and more information.

THE MARVELL ADVANTAGE: Marvell chipsets come with complete reference designs which include board layout designs, software, manufacturing diagnostic tools, documentation, and other items to assist customers with product evaluation and production. Marvell's worldwide field application engineers collaborate closely with end customers to develop and deliver new leading-edge products for quick time-to-market. Marvell utilizes world-leading semiconductor foundry and packaging services to reliably deliver high-volume and low-cost total solutions.

ABOUT MARVELL: Marvell is a leader in storage, communications, and consumer silicon solutions. Marvell's diverse product portfolio includes switching, transceiver, communications controller, processor, wireless, power management, and storage solutions that power the entire communications infrastructure, including enterprise, metro, home, storage, and digital entertainment solutions. For more information, visit our Web site at www.marvell.com.



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