
CES
The Future of Gaming
Starts with Phison
CES 2022 January 5-8, Las Vegas

PHISON

Defining the

Next Generation of Gaming

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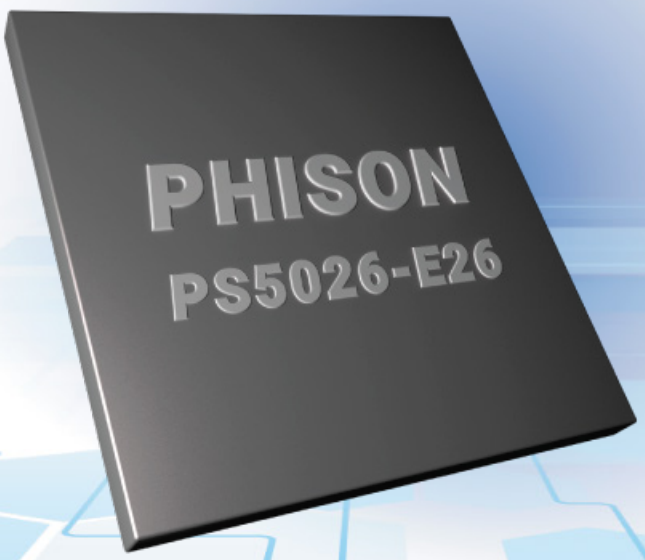
PS5026-E26

First in Class
Best in Performance

E26 PCIe Gen 5 client controller

Phison's first PCIe Gen 5 solution uses our outstanding architecture as a customizable solution to balance power, unique features, and class-leading performance. The E26 charges into the new year to meet the high demands from emerging workloads designed to take advantage of Gen 5 hardware.

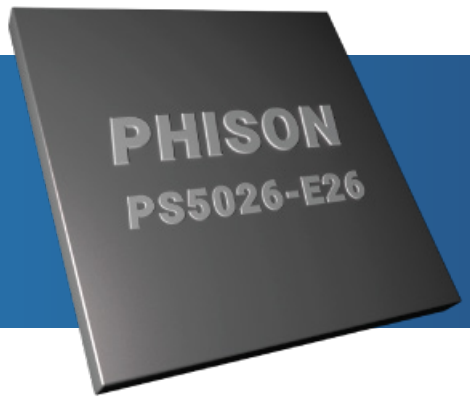


"By helping to enable an ecosystem, Phison's customizable E26 SSD is at the forefront of PCIe Gen 5 introductions and will facilitate data center customers looking to benefit from the technology's increased performance."

Jeff Janukowicz, Research Vice President at IDC.

CONTROLLER

Features	Specifications
Host Interface	- PCIe 5.0 x4 (Bandwidth: 32GT/s x4) - Compliance with PCI Express Base Specification Revision 5.0 - Compliance with NVMe 2.0
Processor	- 2x ARM Cortex-R5 and 3x Proprietary IP CoXProcessor™ - TSMC 12nm process technology
Flash Controller	- Up to 8 Channels with 32 Chips Enable (CE) - Flash transfer rate up to 2,400MT/s - Capacity up to 32TB - Support 3D TLC and QLC NAND flash memory - Compliance with Toggle 5.0 and ONFi 5.0 - Flash I/O operating voltage supply 1.2V
DRAM Controller	- DDR4 & LPDDR4 (32 bit, 3200Mbps)
Data Reliability	- Phison 5th generation LDPC ECC & RAID ECC - DDR ECC engine - End-To-End Data Path Protection
Security	- AES 256 - SHA 512 - RSA 4096 - TCG Opal 2.0
Performance	- Sequential Read up to 12GB/s - Sequential Write up to 11GB/s - 4K Random Read up to 1,500K IOPS - 4K Random Write up to 2,000K IOPS
Power Management	- L1.2
Temperature Range	- Operating range: 0~70 °C - Storage range: -40~85 °C - Operating junction temperature: -40~125 °C
Package	- 576-ball FCCSP, 16 mm x 16 mm
Peripheral	- Built-in internal thermal sensor - GPIO pins - Built-in UART function - I3C and SPI for external ROM



First in Class
PCIe Gen 5 Solution

All-Day Notebook Computing with Gen 4 Performance

A PCIe Gen 4 user experience in a low power M.2 form factor. The E21T allows for all-day computing in a mobile environment while meeting the performance needs of gamers, office workers, and business travelers.

CONTROLLER

Features	Specifications
Host Interface	- PCIe 4.0 x4 (Bandwidth: 16GT/s x4) - Compliance with PCI Express Base Specification Revision 4.0 - Compliance with NVMe 1.4 - Host Memory Buffer (HMB) support
Processor	- Single-CPU architecture with built-in 32-bit microcontroller - TSMC 12nm process technology
Flash Controller	- Up to 4 Channels with 16 Chips Enable (CE) - Flash transfer rate up to 1,600MT/s - Capacity up to 4TB - Support 3D TLC and QLC NAND flash memory - Compliance with Toggle 3.0 and ONFi 4.2 - Flash I/O operating voltage supply 1.2V
DRAM Controller	- DRAM-less
Data Reliability	- Phison 4th generation LDPC ECC & RAID ECC - DDR ECC engine - End-To-End Data Path Protection
Security	- Pyrite - AES 256 - SHA 512 - RSA 4096 - TCG Opal
Performance	- Sequential Read up to 4,800MB/s - Sequential Write up to 4,500MB/s - 4K Random Read up to 550K IOPS - 4K Random Write up to 600K IOPS
Power Management	- L1.2 < 2.7mW
Temperature Range	- Operating range: 0~70 °C - Storage range: -40~85 °C - Operating junction temperature: -40~125 °C
Package	- 198-ball HSFCCSP, 7.5 mm x 12 mm
Peripheral	- Built-in internal thermal sensor - GPIO pins - Built-in UART function - I2C and SPI for external ROM

PS5021-E21T BGA SSD

Next-Generation Leader for NVMe Mobile Gaming

Coin-sized storage for smart devices

The new E21T BGA takes smart device storage to new heights with a 1.65mm Z-height and a massive 1TB capacity. This 11.5mm x 13mm package will power diverse workloads with the ability to make you a gaming champion.

CONTROLLER

Features	Specifications
Host Interface	- PCIe 4.0 x2 (Bandwidth: 16GT/s x2) - Compliance with PCI Express Base Specification Revision 4.0 - Compliance with NVMe 1.4 - Host Memory Buffer (HMB) support
Processor	- Single-CPU architecture with built-in 32-bit microcontroller - TSMC 12nm process technology
Flash Controller	- Up to 4 Channels with 16 Chips Enable (CE) - Flash transfer rate up to 1,600MT/s - Capacity up to 1TB - Support 3D TLC flash memory - Compliance with Toggle 3.0 and ONFi 4.2 - Flash IO operating voltage supply 1.2V
DRAM Controller	- DRAM-less
Data Reliability	- Phison 4th generation LDPC ECC & RAID ECC - DDR ECC engine - End-To-End Data Path Protection
Security	- AES 256 - Pyrite
Performance	- Sequential Read up to 3,600MB/s - Sequential Write up to 3,000MB/s - 4K Random Read up to 500K IOPS - 4K Random Write up to 280K IOPS
Power Management	- L1.2 < 5mW
Temperature Range	- Operating range: 0~70 °C - Storage range: -40~85 °C
Package	- 345-ball BGA, 11.5mm x 13mm
Peripheral	- Built-in internal thermal sensor - GPIO pins - Built-in UART function

PS5013-E13T BGA SSD

NVMe Redefines Mobile Gaming

Phison's first BGA SSD in a smartphone

NVMe is the performance leader in high-speed storage. Phison takes this technology to every level of gaming to produce exceptional user experiences.

NVMe performance with mobile efficiency.

CONTROLLER

Features	Specifications
Host Interface	- PCIe 3.1 x2 (Bandwidth: 8GT/s x2) - Compliance with PCI Express Base Specification Revision 3.1 - Compliance with NVMe 1.3 - Host Memory Buffer (HMB) support
Processor	- Single-CPU architecture with built-in 32-bit microcontroller - TSMC 28nm process technology
Flash Controller	- Up to 4 Channels with 8 Chips Enable (CE) - Flash transfer rate up to 533MT/s - Capacity up to 512GB - Support 3D TLC flash memory - Compliance with Toggle 3.0 - Flash IO operating voltage supply 1.2V
DRAM Controller	- DRAM-less
Data Reliability	- Phison 3rd generation LDPC ECC & RAID ECC - End-To-End Data Path Protection
Security	- AES 256 - TCG Opal - Pyrite
Performance	- Sequential Read up to 1,730MB/s - Sequential Write up to 1,180MB/s - 4K Random Read up to 195K IOPS - 4K Random Write up to 245K IOPS
Power Management	- L1.2 < 2.5mW
Temperature Range	- Operating range: 0~70 °C - Storage range: -40~85 °C
Package	- 345-ball BGA, 11.5 mm x 13 mm
Peripheral	- Built-in internal thermal sensor - GPIO pins - Built-in UART function - I2C and SPI for external ROM

Next Generation Gaming Workload

Storage will drive the user experience in next-gen gaming

Game developers will rely on NVMe storage to deliver a consistent data stream to the GPU in 2022. This model will come to market through DirectX 12 Ultimate® to reduce game load times and expand virtual worlds. Phison is leading in the development of this upcoming technology to meet the challenging requirements of both high performance and performance consistency. In the detailed demonstration at CES 2022, we show why **The Future of Gaming Starts with Phison.**

CONTROLLER

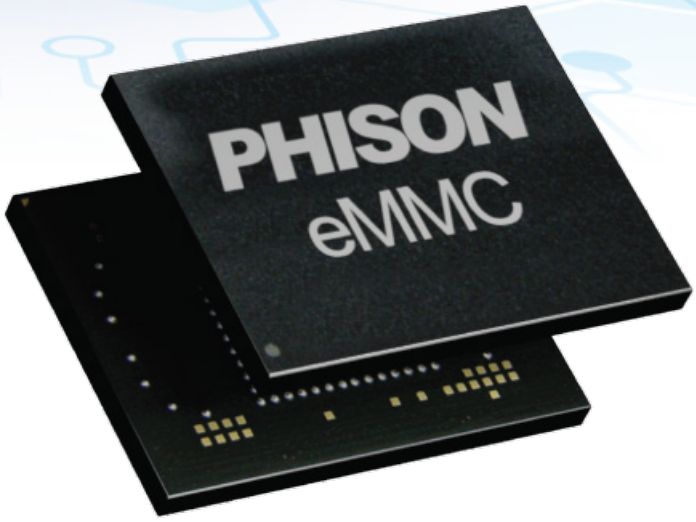
Features	Specifications
Host Interface	- PCIe 4.0 x4 (Bandwidth: 16GT/s x4) - Compliance with PCI Express Base Specification Revision 4.0 - Compliance with NVMe 1.4
Processor	- 3x ARM Cortex-R5 and 2x Proprietary IP CoXProcessor™ - TSMC 12nm process technology
Flash Controller	- Up to 8 Channels with 32 Chips Enable (CE) - Flash transfer rate up to 1,600MT/s - Capacity up to 8TB - Support 3D TLC and QLC NAND flash memory - Compliance with Toggle 4.0 and ONFi 4.2 - Flash I/O operating voltage supply 1.2V/1.8V
DRAM Controller	- DDR4 (32 bit, 2666Mbps)
Data Reliability	- Phison 4th generation LDPC ECC & RAID ECC - DDR ECC engine - End-To-End Data Path Protection
Security	- Pyrite - AES 256 - SHA 512 - RSA 4096 - TCG Opal
Performance	- Sequential Read up to 7,500MB/s - Sequential Write up to 7,100MB/s - 4K Random Read up to 1,000K IOPS - 4K Random Write up to 1,000K IOPS
Power Management	- L1.2 < 5mW
Temperature Range	- Operating range: 0~70 °C - Storage range: -40~85 °C - Operating junction temperature: -40~125 °C
Package	- 529-ball FCCSP, 12 mm x 12 mm
Peripheral	- Built-in internal thermal sensor - GPIO pins - Built-in UART function - I2C and SPI for external ROM

eMMC PS8232

Virtual Worlds Require Real Storage

PS8232 champions award-winning performance for wearables

The unique Phison PS8232 offers best-in-class energy efficiency for wearable devices, IoT, networking and all smart devices. Make your product line stand above the competition with a crushing user experience.



Capacity [1]		16GB	32GB	64GB
Interface		eMMC 5.1		
Form Factor		eMMC		
NAND Flash		YMTC		
Package		BGA 153ball, 11.5 mm x 13 mm		
Performance [2 3]				
Sequential Read		307 MB/s	307 MB/s	307 MB/s
Sequential Write		135 MB/s	135 MB/s	180 MB/s
Random Read		10K IOPS	10K IOPS	13K IOPS
Random Write		16.7K IOPS	16.7K IOPS	17.5K IOPS
Power [4]				
Supply Voltage		VCC=3.3V, VCCQ=1.8V		
Read	**VCC**	102 mA	102 mA	113 mA
	VCCQ	100 mA	100 mA	100 mA
Write	**VCC**	72 mA	72 mA	99 mA
	VCCQ	47 mA	47 mA	51 mA
Standby	**VCC**	40 uA	40 uA	60 uA
	VCCQ	55 uA	55 uA	55 uA
Temperature				
Operating		-25°C~85°C		
Storage		-40°C~105°C		
Advanced Features				
- Pseudo Technology - Field Firmware Update - Power off Notification for Sleep - Production State Awareness				

[1] 1GB = 1,000,000,000 bytes

[2] Measured with Phison 6GS Tester

[3] Sequential performance is based on HS400, Test Content 1024MB and chunk Size 512KB

[4] Measured with RMS Average

PS7101

Introducing Phison's Most Advanced High-Speed PCIe Gen 5 Redriver IC

Phison's redriver comes with a patented Auto Tuning Software package. It can automatically set different gain parameters in the redriver for the customer's motherboard design and trace lengths, collect the results of the signal, and use AI technology to optimize and find the best parameters for the strongest transmission signals.

- Phison's PHiTUNE tool for optimal redriver calibration with improved equalization

- Two Lanes Mux & DeMux interleaved design for better routing and to reduce trace far-end cross talk

- Four-level I/O for EQ and GAIN setting to reduce pin count

- Flip Chip Package with less return loss and better heat dissipation

Features	Specifications
Host Interface	- PCIe 5.0 - Compliance to PCIe 4.0 & Gen 3.0
Process	- GlobalFoundries SiGe BiCMOS 8XP process technology
Configuration	- Interleaved - Embedded MUX/DEMUX function - 2 lanes 4 channel
Performance	- Equalization range: 3~20dB - Output maximum swing: 1,200 mVpp - Output linear range (Max): 1,100 mVpp
Latency	70ps
Power	- Low power mode < 50mW
Temperature Range	- Operating range: -40 to +85 °C
Supply Voltage	3.3V
Package	- FCCSP, 77 pin, 5 mm x 8 mm
EQ Auto-Tuning Tool	- Phison unique redriver tuning tool: PHiTUNE Tool
Features	- Signal adjustment flexibility - Transparent to link training - Rate and coding agnostic - Automatic receiver detect - I2C support - 4-Level I/O for EQ and GAIN - Mux/DeMux function can be disabled - Two EQ setting sweep frequency dimensions - Different setting for A/B port @ pin mode

PHISON

Dominating the Game of Game Load Times

"An SSD of this caliber, once available, will be geared toward the enthusiast, professional. Power user and gamer. Micron's B47R 3D NAND flash memory, when paired with the Phison E18, provides a significant improvement in low QD random read and sequential speeds."

The SSD Review

"Our AMD 5900X test bench is dishing out sequential read performance (lab record) that is up significantly over E18 powered SSDs with 96L flash arrays. The opposite is true for our Intel 11900K test bench, where we see an over 200 MB/s increase (lab record) in sequential write performance."

Jon Coulter, TweakTown

"Short of picking and choosing our results from one side or the other (Intel/AMD), there is one thing that remained constant throughout testing on both Test Bench systems; the sample E18 B47R that we have in hand and put so many hours into testing, is the most powerful SSD to date that we have had tested… no hold barred."

The SSD Review

"Phison's PS5018-E18 is a high-end, high-performance PCIe 4.0 x4 NVMe SSD controller, and now paired with Micron's fastest TLC flash yet is a powerhouse solution that outstrips the best of the best in real-world comparisons".

Tom's Hardware

"Overall, the new Phison PS5018-E18 looks to be a very successful release by the company. […] Phison E18 equipped SSD smoked the competition in most of our VDBench Workloads and boasted top-in-class numbers during the Blackmagic benchmark. Suffice to say, this came as somewhat of a pleasant surprise."

Storage Review

Visit phisonblog.com for thought leadership and Phison technology articles and perspective

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"Phison has been in the NAND flash storage industry for more than two decades. Over the years the company's applications have evolved to allow for more technology and controller innovations for storage devices," said Loreta Tarozaite, Director, Corporate Marketing at Phison Electronics U.S. "We wanted to speak directly to our partners, customers, and performance enthusiasts to bring forward-looking insight to the complicated topic of storage. We believe that by sharing the perspective from the subject matter experts within the company, we will provide more opportunities to collaborate and come up with new ideas and innovations as a whole storage industry community."

PHISON

Direct Storage Access from the GPU Enables More Expansive Virtual Worlds

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