

### C O N S U M E R



# PCIe Gen3 Unleashed

Phison PS5012-E12S (Phison E12S) is a market-proven NAND flash controller IC solution with maxed-out PCIe Gen3 SSD capabilities. As an adaption of Phison's PS5012-E12 (Phison E12), the E12S retains top-notch Gen3-grade performance with savings in both power consumption and PCB floor space taken. A E12Spowered SSD solution is truly the most exciting PCIe Gen3 client platform upgrade no matter from SATA SSDs or mechanical hard drives.

**Application** PCIe Gen3 Client Platforms Mainstream Game Consoles PHISON PS5012-E12S

### **Product Features**

#### **Steady Performance**

As a fully mature DRAM-equipped PCIe Gen3 solution, the E12/E12S is able to attain top-notch sequential performance reaching above 3400MB/s while sustaining consistent performance with minimal latency. A Phison E12/E12S-mounted SSD is the ideal upgrade for those in need of the high-speed throughput from PCIe Gen3.

#### Phison 3rd Generation LDPC ECC engine

Phison's proprietary third-generation ECC Engine based on the LDPC coding scheme effectively maintains NAND flash data reliability. Relative to the prior generation, the 3rd Gen engine comes with even higher correction strength, exacting to more than double of that of a conventional BCH ECC engine.

#### **Excellent Scalability with Flexible Flash Enablement**

Phison E12/E12S supports up to 8 flash channels with 32 Chip Enable (CE) counts on both of the mainstream NAND flash interfaces in ONFI and Toggle, allowing capacity scaling from 512 GB up to 8 TB.

#### **Flexible Security Options**

Phison E12/E12S is well-equipped for the implementation of multiple security functions compliant to industry standards. Along with Phison's proprietary End-to-End Data Path Protection design, the E12/E12S comes with full protection from malware and hacking to eliminate risk of security breaches.

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### CONTROLLER PS5012-E12/E12S

Features	Specifications		
Host Interface	- PCIe 3.0 x4 (Bandwidth: 8GT/s x4) - Backward compatible with existing PCIe generation transfer rates - Compliance with PCI Express Base Specification Revision 3.1 - Compliance with NVMe 1.3		
Processor	- Dual-CPU architecture with built-in 32-bit Arm Cortex-R5 - TSMC 28nm process technology		
Flash Controller	<ul> <li>Up to 8 Channels with 32 Chip Enable (CE) counts</li> <li>Flash transfer rate up to 667MT/s</li> <li>Capacity up to 8TB</li> <li>Support 3D TLC and QLC NAND flash memory</li> <li>Compliance with Toggle 4.0 and ONFi 4.0</li> <li>Flash I/O operating voltage supply 1.2V/1.8V</li> </ul>		
DRAM Controller	- DDR3L (16 bit, 1600Mbps) for E12S - DDR4 (8 bit, 1600Mbps) for E12		
Data Reliability	- Phison 3rd 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 3400MB/s - Sequential Write up to 3000MB/s - 4K Random Read up to 650K IOPS - 4K Random Write up to 650K IOPS		
Power Management	- L1.2 < 5mW		
Temperature Range	- Operating range: 0~70 °C - Storage range: -40~85 °C		
Package	- E12: 529-ball TFBGA, 16 mm x 16 mm - E12S: 529-ball TFBGA, 12 mm x 12 mm		
Peripheral	- Built-in internal thermal sensor - GPIO pins - Built-in UART function - I2C and SPI for external ROM		



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Find more information and resources at: phisonblog.com and phison.com

## **Solutions** PS5012-E12S

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Capacity <sup>(1)</sup>	512 GB	1024 GB	2048 GB	4096 GB	
Interface	PCle Gen 3.0 x4 NVMe 1.3				
Form Factor	M.2 2280				
NAND Flash	3D TLC/QLC				
Performance <sup>(2,3)</sup>					
Sequential Read	3400 MB/s	3400 MB/s	3400 MB/s	3400 MB/s	
Sequential Write	2400 MB/s	3000 MB/s	3000 MB/s	3000 MB/s	
4K Random Read	200K IOPS	400K IOPS	650K IOPS	600K IOPS	
4K Random Write	600K IOPS	640K IOPS	650K IOPS	650K IOPS	
Power <sup>(4)</sup>					
Supply Voltage	M.2 3.3V ± 5%				
Active (Average)	4.9 W	5.7 W	6.0 W	6.3 W	
Idle	21 mW	25 mW	24 mW	34 mW	
Low Power PS4 (L1.2)	2 mW	2 mW	2 mW	2 mW	
Environmental					
Operating Temperature	0°C - 70°C				
Non-Operating Temperature	-40°C - 85°C				
Reliability & Warranty					
TBW (Max) <sup>(5)</sup>	360 TB	720 TB	1440 TB	2880 TB	
MTBF	1.8 million hours				
UBER	<10 <sup>-16</sup> bits				
Advanced Features					
- End-to-End Data Protection - Pyrite Support - OPAL Support - Thermal Monitoring					

(1) 1 GB = 1,000,000,000 bytes
(2) Sequential Performance is based on CrystalDiskMark 6.0.0, 1 GB range, QD=32, Thread=1, and test drive set as secondary

(3) Random Performance is based on IOMeter, 1 GB range, 4K data size, QD=32, 8 worker, 4K aligned

(4) Power consumption is measured during the sequential read and write operations performed by CrystalDiskMark with the conditions described in (2)

(5) TBW is Total Bytes Written and the results are obtained in compliance with JESD218 Standards under JEDEC219A client endurance workload

(6) The performance and power consumption is based on Kioxia BiCS5 TLC pyrite SSD under ambient temperature



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