

# Samsung SSD 960 PRO M.2

Data Sheet Rev.1.2 (October 2017)



## Summary

- PCIe 3.0 x4 NVM Express SSD for Client PCs
- M.2 (2280)
- Samsung V-NAND
- Samsung Polaris controller
- Samsung Magician Software for SSD management

## THE SAMSUNG NVMe SSD 960 PRO

The new Samsung SSD 960PRO is the 2<sup>nd</sup> generation NVMe SSD for Samsung's client PC SSD. As such, the Samsung SSD 960 PRO is designed for professionals & enthusiasts that are seeking next generation performance and endurance. It offers the

ultimate in performance, breaks storage limits for the m.2 form factor and banks on its solid reliability to offer customers the most advanced SSD technology currently available for client PCs

Samsung's unique and innovative V-NAND flash memory architecture is a breakthrough in overcoming the density limitations, while improving on the performance and endurance of today's conventional planar NAND architecture. V-NAND is fabricated by stacking layers vertically over one another rather than decreasing the cells dimensions and trying to fit itself onto a fixed horizontal space resulting in higher density and better performance utilizing a smaller footprint.

## Experience next-generation professional performance and endurance

This cutting-edge V-NAND-based NVMe

SSD supports PCI Express® Gen 3 x4 lanes, providing a higher bandwidth and lower latency to process even more massive amounts of data than our previous-generation NVMe SSD.

Building on the PCIe Gen. 3.0 x 4 lane interface and support of the NVMe 1.2 protocol, the 960PRO, in combination with our advanced 3rd generation V-NAND and newly developed Polaris controller is able to offer sequential read performance of 3,500MB/s and sequential write speeds of 2,100MB/s. The 960PRO achieves random performance of up to 440,000IOPS and 360,000IOPS for read and write operations respectively for industry leading performance across key metrics.

## Breaking storage limits

Thanks to our advanced packaging technology, the use of a four-landing-design and the integration of the DRAM and Polaris Controller in a Package-on-Package solution the 960PRO becomes the world's first client PC SSD in the standard 2280 m.2 form factor to be able to pack 2TB of capacity. For greater consumer choice, the 960PRO will also be available in 1TB and 512GB versions

## Bank on solid reliability

The 960 PRO, thanks to the use of our 3<sup>rd</sup> generation V-NAND Flash technology, offers users not only improved performance and higher density, but also solid reliability.

The 960 PRO's improved thermal solutions, advanced hardware encryption and enhanced endurance enable users to confidently entrust their data to their SSD

## Improved thermal solutions

In most cases of data transfers, heavy workloads can induce heat and result in high temperatures. Once temperatures reach a threshold, memory performance may be adversely affected. As the leader in SSD memory solutions, the 960 PRO adopts a new heat spreader for dissipating heat more efficiently during heavy workload use. It achieves this by integrating a thin copper film and because copper is a great heat conductor it helps to shed heat faster than would be possible without the label. Furthermore, the new 4 landing design also improves thermal characteristics, as it can reduce heat generation per unit area.

## Advanced data encryption

The 960 PRO provides the same data encryption features as other Samsung SATA SSDs. Self-Encrypting Drive (SED) security technology will help keep data safe at all times. It includes an AES 256-bit hardware-based encryption engine to ensure that your personal files remain secure. Being hardware-based, the encryption engine secures your data without performance degradation that you may experience with a software-based encryption. Also, the 960PRO is compliant with advanced security management solutions (TCG Opal and Encrypted Drive - IEEE1667).

## Enhanced endurance

When users spend money on an SSD, first of all, they consider value for money and want an SSD that will last. Starting with the 850 PRO, Samsung's 1st V-NAND SATA SSD, Samsung's V-NAND changed the paradigm. Now in its 3rd generation, the 960 PRO boasts Total Bytes Written of up to 1.2 Petabytes for the 2TB model.

## Technical Specifications

Samsung SSD 960 PRO					
<b>Usage Application</b>	Client PCs				
<b>Interface</b>	PCIe Gen 3.0 x4, NVMe 1.2				
<b>Hardware Information</b>	Capacity	512GB <sup>†</sup>	1TB(1,024GB <sup>†</sup> )	2TB(2,048GB <sup>†</sup> )	
	Controller	Samsung Polaris Controller			
	NAND Flash Memory	Samsung V-NAND Flash memory			
	DRAM Cache Memory	512MB LP DDR3	1GB LP DDR3	2GB LP DDR3	
	Dimension	Max 80.15 x Max 22.15 x Max.2.38 (mm)			
	Form-Factor	M.2(2280) <sup>††</sup>			
<b>Performance*</b> (Up to.)	Sequential Read	3,500MB/s			
	Sequential Write	2,100MB/s			
	QD 1 Thread 1	Ran. Read	14,000 IOPS		
		Ran. Write	50,000 IOPS		
	QD 32 Thread 4	Ran. Read	330,000 IOPS	440,000 IOPS	440,000 IOPS
Ran. Write		330,000 IOPS	360,000 IOPS	360,000 IOPS	
<b>Power Consumption**</b>	Idle	Typ. 40mW			
	Active (AVG.)	Read	Typ. 5.1W	Typ. 5.3W	Typ. 5.8W
		Write	Typ. 4.7W	Typ. 5.2W	Typ. 5.2W
DEVSLEEP	L1.2 mode	Typ. 5mW	Typ. 5mW	Typ. 8mW	
<b>Data Security</b>	AES 256-bit for User Data Encryption, TCG/Opal, Encrypted Drive(IEEE1667)				
<b>Supporting Features</b>	TRIM(Required OS support), Garbage Collection, S.M.A.R.T				
<b>Temperature</b>	Operating	0°C to 70°C (Measured by SMART Temperature. Proper airflow recommended)			
	Non-Operating	-45°C to 85°C			
<b>Humidity</b>	5% to 95%, non-condensing				
<b>Shock</b>	Non-Operating	1,500G, duration: 0.5ms, 3 axis			
<b>Vibration</b>	Non-Operating	20~2,000Hz, 20G			
<b>Reliability</b>	MTBF	1.5 million hours			
<b>Weight</b>	Model	Max 8.3g	Max 8.5g	Max 9g	
	Total Bytes Written	400 TBW***	800 TBW***	1,200 TBW***	
<b>Warranty</b>	Period	5 years limited			

\* Sequential performance measurements based on CrystalDiskMark 5.1.2, and Random performance measurements based on Iometer 1.1.0. Performance may vary based on SSD's firmware version, system hardware & configuration. Test system configuration: Intel Core i7-6700K @ 4.0GHz, DDR4 1,700MHz 16GB, OS – Windows10 Pro x64, ASROCK Z170 EXTREME 7

\*\* Power consumption measured with Iometer 1.1.0 with Intel i7-5820K @ 3.3GHz, DDR4 8GB, ASUS X99-M WS/SE, OS- Windows10 Pro x64 and APST on

\*\*\* TBW means Terabytes Written

† 1GB=1,000,000,000 bytes by IDEMA. A certain portion of capacity may be used for system file and maintenance use, so the actual capacity may differ from what is indicated on the product label.

†† M.2 is a specification of form factor for ultra-thin PCs, The M.2 standard allows widths 12, 16, 22 and 30mm and lengths of 16, 26,30, 38, 42, 69, 80 and 110 mm, Commercially M.2 is popular with width 22mm and lengths 30, 42, 60 , 80 and 110mm. Samsung provides the most popular form factor with 22mm X 80mm model (i.e., 2280) to consider user convenience

## Product Lineup

Density	Model Name	Box Contents	Model Code
2TB (2,048GB*)	MZ-V6P2T0	Samsung SSD 960 PRO 2TB Warranty statement	MZ-V6P2T0BW
1TB (1,024GB*)	MZ-V6P1T0	Samsung SSD 960 PRO 1TB Warranty statement	MZ-V6P1T0BW
512 GB*	MZ-V6P512	Samsung SSD 960 PRO 512GB Warranty statement	MZ-V6P512BW

\* GB: 1GB = 1,000,000,000 bytes. A certain portion of capacity may be used for system file and maintenance use, thus the actual capacity may differ that indicated on the product label.

For more information, please visit

[www.samsung.com/ssd](http://www.samsung.com/ssd) and [www.samsungssd.com](http://www.samsungssd.com)

To download the latest software & manuals, please visit [www.samsung.com/samsungssd](http://www.samsung.com/samsungssd)

### DISCLAIMER

SAMSUNG ELECTRONICS RESERVES THE RIGHT TO CHANGE PRODUCTS, INFORMATION AND SPECIFICATIONS WITHOUT NOTICE.

Products and specifications discussed herein are for reference purposes only. All information discussed herein may change without notice and is provided on an "AS IS" basis, without warranties of any kind. This document and all information discussed herein remain the sole and exclusive property of Samsung Electronics. No license of any patent, copyright, mask work, trademark or any other intellectual property right is granted by one party to the other party under this document, by implication, estoppels or otherwise. Samsung products are not intended for use in life support, critical care, medical, safety equipment, or similar applications where product failure could result in loss of life or personal or physical harm, or any military or defense application, or any governmental procurement to which special terms or provisions may apply. For updates or additional information about Samsung products, contact your nearest Samsung office.

### COPYRIGHT © 2017

This material is copyrighted by Samsung Electronics. Any unauthorized reproductions, use or disclosure of this material, or any part thereof, is strictly prohibited and is a violation under copyright law.

### TRADEMARKS & SERVICE MARKS

The Samsung Logo is the trademark of Samsung Electronics. Adobe is a trademark and Adobe Acrobat is a registered trademark of Adobe Systems Incorporated. All other company and product names may be trademarks of the respective companies with which they are associated.