

## A750Pi and A650Si/Sc Series: Bringing 3D TLC Endurance Closer to SLC/MLC

66% Higher than Other SSDs in Native TLC, 50% in pSLC

Manufactured using a new die package, the new A750Pi and A650Si/Sc Series embedded solid state drives (SSDs) are breaking endurance records. Compared with other 3D TLC drives, they deliver 66% higher endurance in native triple level cell (TLC) mode and 50% higher in pseudo single level cell (pSLC) mode, making them on par with drives built on multi-level cell (MLC) and SLC flash, respectively.

#### **Key Features**

- Available in M.2 2280/2242, 2.5" & mSATA form factors
- Endurance on par with MLC & SLC flash
- 120 to 1920 GB capacities for native TLC (A650Si/A650Sc)
- 80 to 640 GB capacities for pSLC (A750Pi)
- Industrial temperature operable (A750Pi/A650Si)
- MCU-based Power Loss Protection design with Level 4 data-in-flight) protection
- LDPC ECC & RAID support
- End-to-end data path protection
- SED features\*

\*Optional

## Why A750Pi and A650Si/Sc Series ATP SSDs?

Endurance Suited for Write-Intensive Workloads

ATP's new 3D TLC SSDs leap to new endurance heights, thanks to a new die package. In native TLC mode, the A650Si/Sc Series delivers 66% higher TBW than other SSDs to achieve near-MLC endurance. For the A750Pi Series in pSLC mode, it's 50% higher to match SLC endurance.





ATE

A750Pi

Native TLC mode

Pseudo SLC

## Reliability Testing and Validation: Setting ATP SSDs a Cut Above the Rest

Reliability testing is an important cornerstone in the ATP manufacturing process. ATP's embedded SATA SSDs go through standard as well as customizable testing depending on customer requests and application-specific requirements.



#### Four-Corner, Temperature Cycling, and Power Cycling Tests

Demonstrate reliable performance and stored data handling without data miscompare even under harsh conditions.



### End-of-Life Validation Test

Makes sure that ATP SSDs perform reliably and maintain data integrity over their life span (and even beyond) as required.



#### PCBA Solderability Validation

Ensures effective bonding of components on the printed circuit board assembly (PCBA) for reliable electro-mechanical connections.



#### Reliability Demonstration Test (RDT)

Validates the mean time between failures (MTBF) rating of the drive through actual drive-level testing instead of relying on reliability prediction systems.

### MCU-Based Power Loss Protection Design

The newly designed power loss protection (PLP) array includes a power management IC (PMIC) and firmware-programmable MCU (microcontroller unit), allowing the PLP array to perform intelligently in various temperatures, power glitches and charge states.





### **Product Specifications**

		2.5″			M.2 2280		
Product Line	A750Pi	A650Si	A650Sc	A750Pi	A650Si	A650Sc	
Flash Type			3D <sup>-</sup>	TLC			
Flash Mode	Pseudo SLC	TLC	TLC	Pseudo SLC	TLC	TLC	
Operating Temperature (Tcase)1	-40°C to 85°C		0°C to 70°C	-40°C	to 85°C	0°C to 70°C	
Power Loss Protection Options	Hardware + Firmware Based						
Optional SED Features	-	- AES 256-bit Encryption, TCG Opal 2.0 - AES 256-bit				ption, TCG Opal 2.0	
Capacity	80 GB to 640 GB	120 GB to 1920 GB	120 GB to 1920 GB	80 GB to 320 GB	120 GB to 960 GB	120 GB to 960 GE	
			Perfor	mance			
Performance Sequential Read (MB/s) up to	560	560	560	560	560	560	
Performance Sequential Write (MB/s) up to	520	500	500	520	440	440	
Performance Random Read IOPS (4K,QD32) up to	95,000	100,000	100,000	94,000	100,000	100,000	
Performance Random Writes IOPS (4K, QD32) up to	86,000	91,000	91,000	86,000	88,000	88,000	
10P3 (4K, QD32) up to	Endurance and Reliability						
Endurance (TBW)² up to	38,400 TB         9,310 TB         9,310 TB         19,200 TB         4,655 TB         4,655 TB						
ReliabilityMTBF @ 25°C	>2,000,000 hours						
Data Retention @ 30°C <sup>3</sup>			5 years (with <sup>-</sup>	10% P/E cycle)			
	Others						
Power Consumption	5V Input Power	5V Input Power	5V Input Power	3.3V Input Power	3.3V Input Power	3.3V Input Powe	
Dimensions: L x W x H (mm)	100 x 69.9 x 7/9.2	100 x 69.9 x 7/9.2	100 x 69.9 x 7/9.2	80 x 22 x 3.35	80 x 22 x 3.35	80 x 22 x 3.35	
Certifications	CE, FCC, BSMI, UKCA, RoHS, REACH						
Warranty	5 years	2 years	2 years	5 years	2 years	2 years	
		M.2 2242			mSATA		
Product Line	A750Pi	A650Si	A650Sc	A750Pi	A650Si	A650Sc	
Flash Type							
			3D -	TLC			
Flash Mode	Pseudo SLC	TLC	3D <sup>-</sup> TLC	TLC Pseudo SLC	TLC	TLC	
	Pseudo SLC -40°C t			Pseudo SLC	TLC to 85°C	TLC 0°C to 70°C	
Flash Mode Operating Temperature (Tcase) <sup>1</sup> Power Loss Protection			TLC	Pseudo SLC -40°C			
Flash Mode Operating Temperature (Tcase) <sup>1</sup>		to 85°C	TLC 0°C to 70°C	Pseudo SLC -40°C	to 85°C		
Flash Mode Operating Temperature (Tcase) <sup>1</sup> Power Loss Protection Options		to 85°C	TLC 0°C to 70°C Hardware + Fir	Pseudo SLC -40°C	to 85°C	0°C to 70°C	
Flash Mode Operating Temperature (Tcase) <sup>1</sup> Power Loss Protection Optional SED Features	-40°C t	to 85°C AES 256-bit Encry	TLC 0°C to 70°C Hardware + Fir ption, TCG Opal 2.0	Pseudo SLC -40°C mware Based - 80 GB to 160 GB	to 85°C AES 256-bit Encry	0°C to 70°C	
Flash Mode Operating Temperature (Tcase) <sup>1</sup> Power Loss Protection Optional SED Features Capacity Performance Sequential	-40°C t	to 85°C AES 256-bit Encry	TLC 0°C to 70°C Hardware + Fir ption, TCG Opal 2.0 120 GB to 480 GB	Pseudo SLC -40°C mware Based - 80 GB to 160 GB	to 85°C AES 256-bit Encry	O°C to 70°C	
Flash Mode Operating Temperature (Tcase)' Power Loss Protection Optional SED Features Capacity Performance Sequential Read (MB/s) up to Performance Sequential	-40°C t - 80 GB to 160 GB 560	to 85°C AES 256-bit Encry 120 GB to 480 GB 560	TLC 0°C to 70°C Hardware + Fin ption, TCG Opal 2.0 120 GB to 480 GB Perform 560	Pseudo SLC -40°C mware Based 80 GB to 160 GB mance 560	to 85°C AES 256-bit Encry 120 GB to 480 GB 560	0°C to 70°C ption, TCG Opal 2.0 120 GB to 480 G 560	
Flash Mode Operating Temperature (Tcase) <sup>1</sup> Power Loss Protection Optional SED Features Capacity Performance Sequential Read (MB/s) up to	-40°C t - 80 GB to 160 GB	o 85°C AES 256-bit Encry 120 GB to 480 GB	TLC 0°C to 70°C Hardware + Fir ption, TCG Opal 2.0 120 GB to 480 GB Perfore	Pseudo SLC -40°C mware Based - 80 GB to 160 GB mance	to 85°C AES 256-bit Encry 120 GB to 480 GB	0°C to 70°C ption, TCG Opal 2.0 120 GB to 480 G	
Flash Mode  Operating Temperature (Tcase) <sup>1</sup> Power Loss Protection Optional SED Features Capacity  Performance Sequential Read (MB/s) up to Performance Random Read IOPS (4K,QD32) up to Performance Random Writes	-40°C t - 80 GB to 160 GB 550	AES 256-bit Encry 120 GB to 480 GB 560 440	TLC 0°C to 70°C Hardware + Fin ption, TCG Opal 2.0 120 GB to 480 GB Perfor 560 440	Pseudo SLC -40°C mware Based 560 520	to 85°C AES 256-bit Encry 120 GB to 480 GB 560 440	0°C to 70°C ption, TCG Opal 2.0 120 GB to 480 G 560 440	
Flash Mode Operating Temperature (Tcase) <sup>1</sup> Power Loss Protection Optional SED Features Capacity Performance Sequential Read (MB/s) up to Performance Random Read IOPS (4K,QD32) up to	-40°C t - 80 GB to 160 GB 560 520 84,500	AES 256-bit Encry 120 GB to 480 GB 560 440 100,000	TLC 0°C to 70°C Hardware + Fin ption, TCG Opal 2.0 120 GB to 480 GB Perfor 560 440 100,000 88,000	Pseudo SLC -40°C mware Based 30 GB to 160 GB 30 GB to 160 GB 520 520 94,000 85,000	to 85°C AES 256-bit Encry 120 GB to 480 GB 560 440 100,000	0°C to 70°C ption, TCG Opal 2.0 120 GB to 480 G 560 440 100,000	
Flash Mode Operating Temperature (Tcase) <sup>1</sup> Power Loss Protection Optional SED Features Capacity  Performance Sequential Read (MB/s) up to Performance Random Read IOPS (4K, QD32) up to Performance Random Writes IOPS (4K, QD32) up to	-40°C 1 - 80 GB to 160 GB 560 520 84,500 84,500	AES 256-bit Encry 120 GB to 480 GB 560 440 100,000 88,000	TLC 0°C to 70°C Hardware + Fin 120 GB to 480 GB 120 GB to 480 GB 660 440 100,000 88,000 Endurance ar	Pseudo SLC -40°C mware Based a0 GB to 160 GB a0 GB to 160 GB 560 520 520 94,000 85,000	to 85°C AES 256-bit Encry 120 GB to 480 GB 560 440 100,000 88,000	0°C to 70°C ption, TCG Opal 2.0 120 GB to 480 G 560 440 100,000 88,000	
Flash Mode Operating Temperature (Tcase) <sup>1</sup> Power Loss Protection Optional SED Features Capacity Performance Sequential Read (MB/s) up to Performance Random Read IOPS (4K,QD32) up to Performance Random Writes IOPS (4K,QD32) up to	-40°C t - 80 GB to 160 GB 560 520 84,500	AES 256-bit Encry 120 GB to 480 GB 560 440 100,000	TLC 0°C to 70°C Hardware + Fin 120 GB to 480 GB 120 GB to 480 GB 120 GB to 480 GB 120 GB to 480 GB 680 00 688,000 6 Endurance ar 2,327 TB	Pseudo SLC -40°C -30°C 30°GB to 160°GB 30°GB to 160°GB 350°C	to 85°C AES 256-bit Encry 120 GB to 480 GB 560 440 100,000	0°C to 70°C ption, TCG Opal 2.0 120 GB to 480 G 560 440 100,000	
Flash Mode Operating Temperature (Tcase)' Power Loss Protection Optional SED Features Capacity Performance Sequential Read (MB/s) up to Performance Random Read (DPS (4K,QD32) up to Performance Random Writes IOPS (4K,QD32) up to Performance Random Writes IOPS (4K,QD32) up to	-40°C 1 - 80 GB to 160 GB 560 520 84,500 84,500	AES 256-bit Encry 120 GB to 480 GB 560 440 100,000 88,000	TLC 0°C to 70°C Hardware + Fin ption, TCG Opal 2.0 120 GB to 480 GB Perfor 560 440 100,000 88,000 Endurance ar 2,327 TB >2,000,0	Pseudo SLC -40°C mware Based 30 GB to 160 GB 30 GB to 160 GB 560 520 520 40 60 60 60 60 60 60 60 60 60 6	to 85°C AES 256-bit Encry 120 GB to 480 GB 560 440 100,000 88,000	0°C to 70°C ption, TCG Opal 2.0 120 GB to 480 G 560 440 100,000 88,000	
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Flash Mode Operating Temperature (Tcase) <sup>1</sup> Power Loss Protection Optional SED Features Capacity Performance Sequential Write (MB/s) up to Performance Random Read (MB/s) up to Performance Random Writes IOPS (4K, QD32) up to Performance Random Writes IOPS (4K, QD32) up to Performance Random Writes (MB/s) up to Performance Random Writes (MB/s) up to Performance Random Writes IOPS (4K, QD32) up to Performance Random Writes IOPS (4K, QD32) up to Power Consumption	-40°C 1 - 0 80 GB to 160 GB 560 520 84,500 84,500 9,600 TB 9,600 TB	AES 256-bit Encry 120 GB to 480 GB 560 440 100,000 88,000 2,327 TB	TLC         0°C to 70°C         Hardware + Fin         ption, TCG Opal 2.0         120 GB to 480 GB         20 GB to 480 GB         560         440         100,000         688,000         Endurance an         2,327 TB         >2,000,0         5 years (with and	Pseudo SLC -40°C -40°C -40°C - - - - - - - - - - - - -	to 85°C AES 256-bit Encry 120 GB to 480 GB 560 440 100,000 88,000 2,327 TB 2,327 TB	0°C to 70°C ption, TCG Opal 2.0 120 GB to 480 G 560 440 100,000 88,000 2,327 TB 3.3V Input Powe	

<sup>1</sup> Case Temperature, the composite temperature as indicated by SMART temperature attributes.

<sup>2</sup> Under highest Sequential write value. May vary by density, configuration and applications.
 <sup>3</sup> Data retention value may vary across different temperature ranges. It is based on experimental results and should be used only for reference.

### **Order Information**

Ordering Information								
Product Line	Form Factor	Capacity <sup>1</sup>	Endurance <sup>2</sup>	P/N Operable with Industrial Temp.	P/N Operable with Commercial Temp.			
	2.5"	120 GB	582 TB	AF120GSTCJ-7BCIP	AF120GSTCJ-7BCXP			
		240 GB	1,164 TB	AF240GSTCJ-7BCIP	AF240GSTCJ-7BCXP			
		480 GB	2,327 TB	AF480GSTCJ-7BCIP	AF480GSTCJ-7BCXP			
		960 GB	4,655 TB	AF960GSTCJ-7BCIP	AF960GSTCJ-7BCXP			
		1920 GB	9,310 TB	AF1T92STCJ-7BCIP	AF1T92STCJ-7BCXP			
A650Si/A650Sc	M.2 2242	120 GB	582 TB	AF120GSTIA-7BCIP	AF120GSTIA-7BCXP			
		240 GB	1,164 TB	AF240GSTIA-7BCIP	AF240GSTIA-7BCXP			
		480 GB	2,327 TB	AF480GSTIA-7BCIP	AF480GSTIA-7BCXP			
(Native TLC)	M.2 2280	120 GB	582 TB	AF120GSTIC-7BCIP	AF120GSTIC-7BCXP			
		240 GB	1,164 TB	AF240GSTIC-7BCIP	AF240GSTIC-7BCXP			
		480 GB	2,327 TB	AF480GSTIC-7BCIP	AF480GSTIC-7BCXP			
		960 GB	4,655 TB	AF960GSTIC-7BCIP	AF960GSTIC-7BCXP			
	mSATA	120 GB	582 TB	AF120GSTHI-7BCIP	AF120GSTHI-7BCXP			
		240 GB	1,164 TB	AF240GSTHI-7BCIP	AF240GSTHI-7BCXP			
		480 GB	2,327 TB	AF480GSTHI-7BCIP	AF480GSTHI-7BCXP			
A750Pi (Pseudo SLC)	2.5"	80 GB	4,800 TB	AF80GSACJ-7BBIP				
		160 GB	9,600 TB	AF160GSACJ-7BBIP				
		320 GB	19,200 TB	AF320GSACJ-7BBIP				
		640 GB	38,400 TB	AF640GSACJ-7BBIP				
	M.2 2242	80 GB	4,800 TB	AF80GSAIA-7BBIP				
		160 GB	9,600 TB	AF160GSAIA-7BBIP				
	M.2 2280	80 GB	4,800 TB	AF80GSAIC-7BBIP				
		160 GB	9,600 TB	AF160GSAIC-7BBIP				
		320 GB	19,200 TB	AF320GSAIC-7BBIP				
	mSATA	80 GB	4,800 TB	AF80GSAHI-7BBIP				
		160 GB	9,600 TB	AF160GSAHI-7BBIP				
Self-Encrypting Drive upon request and on project basis.								

<sup>1</sup> Amount of actual usable storage that can be utilized

<sup>2</sup> TBW in Sequential Write

Product spec and its related information are subject to change without advance notice. Please refer to <u>www.atpinc.com</u> for latest information

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