

Extensive NVMe Lineup Offers Customizable Thermal Management, I-Temp Support, and Optimal Capacities for Diverse High-Performance Applications

Key Features

- Capacities: 40 GB to 7.68 TB
- Operating Temperature: -40°C to 85°C (I-Temp) or 0°C to 70°C (C-Temp)
- Flash Mode Configurations: pSLC or native TLC
- Optional
 - Thermal management / heatsink solutions
 - SED features (AES-256 encryption, TCG Opal 2.0 compliance)

The NVMe transport protocol delivers high bandwidth and low latency through the PCI Express (PCIe) bus. ATP M.2 2280 and U.2 SSDs based on NVMe specifications deliver fast response times even for complex applications.

ATP's NVMe SSDs are suitable for all kinds of computing environments, but they are especially strong and reliable when installed in compact systems with little to no ventilation and when operating in extreme or harsh conditions. Available with optional customizable heatsink and firmware thermal management solutions, they deliver consistent sustained performance without drastic drops even when running at top speeds. They are built on 3D TLC flash configured as either native TLC or pSLC mode for extended endurance. Select SSDs are self-encrypting drives (SEDs) with AES-256 encryption and are compliant with TCG Opal 2.0.

COMING SOON!

NVMe M.2 2280 and U.2 SSDs Built on 176-layer 3D TLC NAND with PCIe Gen 4.0 x4 Lanes Deliver Quicker, More Responsive Performance for Data-Heavy Workloads

Key Features

- Form Factors: M.2 and U.2
- Capacities
 - M.2 2280: 240/480/960/1920/3840 GB
 - U.2: 960 GB, 1.92/3.84/7.68 TB
- LDPC ECC, End-to-End Data Path Protection
- Optional
 - Anti-sulfuric capacitors for M.2 2280
 - SED features (AES-256 encryption, TCG Opal 2.0 compliance)

ATP leverages breakthrough replacement-gate NAND technology and PCI Express (PCIe) Generation 4.0 interface to boost the read/write performance of its latest solid-state drives. Available in M.2 2280 and U.2 form factors, these SSDs are built on an unprecedented 176-layer 3D TLC NAND flash, which uses a smaller die size yet offers higher densities and 35% faster read and write. This translates to faster boot times and application responsiveness.

The PCIe Generation 4.0 interface doubles the PCIe 3.0 data transfer rate from 8 GT/s (giga transfers per second) per lane to 16 GT/s per lane. Using 4 PCIe lanes, the SSDs will operate at a maximum theoretical transfer rate of 64 GT/s, compared with 32 GT/s via PCIe 3.0. With this significant bandwidth increase, PCIe Gen4 x4 SSDs enables faster data transmission and lower latency.

The new NVMe M.2 2280 SSDs offer up to 7500 MB/s and 6800 MB/s sequential read/write performance, respectively. They will be available in capacities of 240/480/960/1920/3840 GB.

NVMe M.2 2280 SSDs with anti-sulfur* components are protected from the damaging effects of sulfur contamination, especially when installed in systems or devices that are near volcanoes, hot springs, mining areas or other areas that are susceptible to sulfur contamination.

The NVMe U.2 SSDs will also don the latest PCIe 4.0 interface on x4 lanes, delivering ultra-speedy read/write performance. The larger form factor has the advantage of offering massive capacities from 960 GB to 7.68 TB. Sequential read/write performance is up to 7600 MB/s and 6800 MB/s, respectively. Onboard DDR4 DRAM offers better performance while its larger physical size allows better dissipation and operation at higher temperatures, thus increasing the SSD lifespan.

* Optional, value-added feature



COMING SOON!

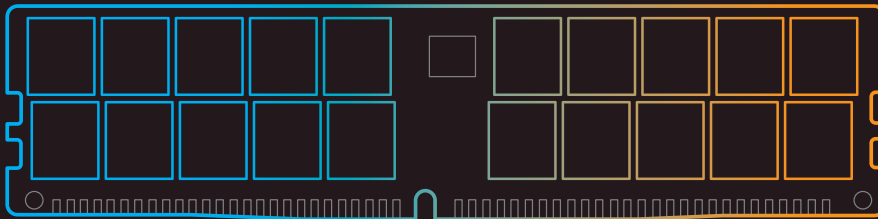
DDR5: Built to Meet Ever-Growing Memory Needs with 2X the Speed, 4X the Capacity and Greater Power Efficiency

Slated for release in the second half of 2022, ATP's DDR5 solutions are expected to deliver performance and reliability improvements over the previous generation, especially for critical computing applications.

As the next-generation DRAM specification, DDR5 is poised to exceed DDR4 in every way. DDR5 promises faster performance, higher memory bandwidth, higher densities, and a new power management structure that delivers better power efficiency.

All of these advantages, and more, are expected to meet the ever-growing memory needs of present and future applications. Both DDR4 and DDR5 dual-inline memory modules (DIMMs) still have 288 pins, but with DDR5's higher bandwidth, this means it can transmit data faster. While the pin count is the same, DDR5 DIMMs will not fit in DDR4 sockets as the alignment key is located differently and the pinouts have been changed to accommodate the new features.

For more information on DDR5 and its advantages over DDR4, please go to page 21.



Up to

6.4 Cbps

Memory Bandwidth

4800 to 6400 MHz

Frequency / Transfer Rate

Per die

Up to 64 Cb

Memory Density

1.1 v

Operating Voltage

DRAM Solutions

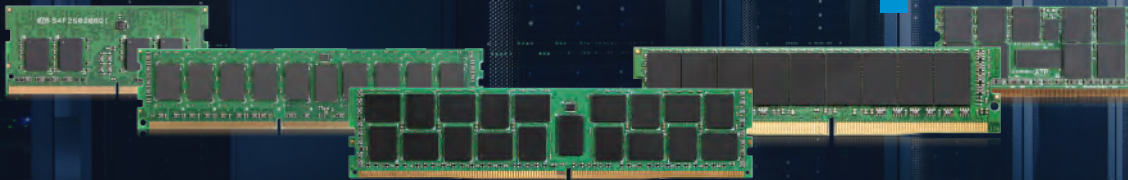
Intense Performance for Intense Workloads

ATP's industrial DRAM modules are built tough and can meet the exacting demands of the growing enterprise. On call 24/7, these hardworking modules are fast, can withstand harsh operating environments, and can handle large bandwidth requirements. ATP's DRAM lineup consists of legacy SDRAM, and a complete range of DDR1, DDR2, DDR3, DDR4, and upcoming DDR5 modules. They are available as RDIMM, RDIMM VLP, UDIMM/UDIMM ECC, SO-DIMM/SO-DIMM ECC, Mini-RDIMM, and Mini-UDIMM/ Mini-UDIMM ECC.



DRAM Modules

Multi-Generational Accelerated Computing



ATP DRAM modules meet the growing need for accelerated performance in memory-intensive and high-performance computing applications to keep up with intensifying data processing requirements as the Internet of Things (IoT) and industrial IoT (IIoT) inevitably become more pervasive. Multi-generational solutions range from legacy DDR3/DDR2/DDR1 to the latest DDR4-3200 modules and upcoming DDR5 solutions, which deliver robust performance, durable build and the right density for the toughest workloads.

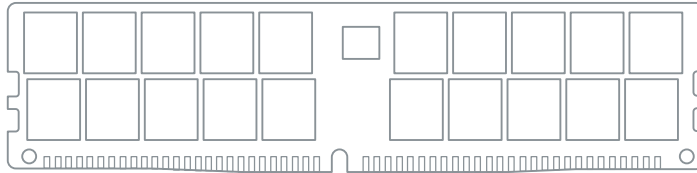
Key Differentiators*

- **Value-Added Customization Services**
 - **Conformal Coating.** ATP's conformal coating solution uses parylene coating technology via chemical vapor deposition (CVD), which is compliant with US Military Material MIL-I-46058C and Fire Safety UL94V-0 Certification standards. The coating completely penetrates spaces as narrow as 0.01 mm, making it totally pinhole-free and truly conformal to shield the DRAM module from dust, chemicals, moisture, and other harmful substances.
 - **Chamfering PCB Design.** Chamfering refers to the process of "beveling or tapering" the connector edges for easier insertion into the memory slots. The bevel is done at specific angles, typically at around 40° to 50°.
- **Wide Temperature.** Wide-temperature ICs supporting -40°C to 85°C operating range offer the best solution to reach industrial grade performance at a lower cost.
- **Product Longevity Program.** Micron Technology, Inc. endorses ATP as a partner to support selected SDR/DDR/DDR2 modules. ATP will continue to manufacture legacy SDR/DDR/DDR2 DRAM modules for Micron's customers that are unable to migrate, including selected legacy DRAM modules specifically for customers using AMD Embedded/Geode platforms.
- **System-Level TDBI.** Test During Burn-In (TDBI) combines temperature, load, speed and time to stress test memory modules and expose weak modules. Even just 0.01% error on a 99.99% effective device can increase the failure rates at the module level and lead to failure in actual usage. ATP's system-level TDBI can detect and screen out the 0.01% error to ensure utmost reliability.

* May vary by product and project support.

Upcoming DDR5 Solutions: The New Memory Standard of Speed, Density and Power Management

The growing complexity and volume of workloads is necessitating the adoption of a new memory standard to meet a multitude of memory requirements across varied industries. ATP's DDR5 solutions, expected to roll out in the second half of 2022, are geared for rigorous applications requiring enhancements from the previous generation. They deliver better performance not only in terms of speed, but also superior reliability, higher densities, lower power consumption, and longer service life.



DDR5 Advantages Over DDR4

- **Memory Bandwidth.** DDR5 memory bandwidth is initially at 4.8 Gbps per pin, compared with DDR4's 3.2 Gbps. Future versions are expected to double DDR4's, going up to a maximum of 6.4 Gbps.
- **Frequency / Transfer Rate.** DDR4 frequency ranges from 1866 to 3200 MHz, while DDR5 ranges from 4800 to 6400 MHz initially, but may go as high as 8400 MHz.
- **Burst Length.** This is the amount of data, which is input/output based on a single read/write command in DRAM. DDR5 doubles DDR4 burst length from 8 to 16, thus increasing the read/write efficiency.
- **Power Management and Consumption.** The first power management IC (PMIC) on DIMM is introduced in DDR5. PMIC performs local voltage regulation on the module. Historically, voltage regulation has been done on the motherboard. PMIC on the module allows additional features such as threshold protection, error injection capabilities, programmable power-on sequence, and power management features. DDR5 further reduces power consumption from DDR4's 1.2V to 1.1V.

The following table summarizes important enhancements of DDR5 from DDR4.

	DDR5	DDR4
VDD*	1.1V	1.2V
Data Rates	4800 to 6400 MT/s	1866 to 3200 MT/s
Component Density	16 Gb to 64 Gb	4 Gb to 16 Gb
DQ Bus Width (NON-ECC/ECC)	64/80 bits	64/72 bits
On-Die ECC	Yes	No
Power Management	On DIMM PMIC*	On Motherboard

* VDD: Stands for Voltage Drain Drain, which is the drain power voltage
 PMIC: Power Management Integrated Circuit

ATP Meets Continued Demand for DDR3 Modules

With DDR4 as the current mainstream memory and companies preparing for DDR5, major memory makers are slowing down the production of DDR3 or phasing it out. However, systems that have been running for a long time supporting DDR3 remain widely in use for industrial, networking, and other embedded applications. Through its partnership with Micron, ATP is committed to supporting the continued demand for DDR3 SO-DIMM and UDIMM in the next 3 to 5 years.

Product Information

Module Type	DDR3 SO-DIMM	DDR3 UDIMM
Capacity	4 GB / 8 GB	4 GB / 8 GB
Function	ECC/NON-ECC	ECC/NON-ECC
Frequency	1866 MHz	1866 MHz

Micron and ATP Partnership and License Agreements Ensure Legacy DDR2/DDR/SDR DRAM Module Supply

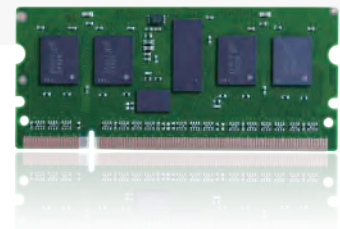
Recognizing that legacy memory modules are still in prevalent use, ATP Electronics, Inc. and Micron Technology, Inc. have signed partnership and license agreements to ensure consistent supply for customers that are yet unable to upgrade to newer-generation platforms after Micron announced end-of-life (EOL) notices for these modules.



DDR2 Continuity Program

With DDR2 still widely deployed in the US, Japan and Europe, ATP and Micron are making sure that these markets will have a steady supply of Micron DDR2 SO-DIMMs and UDIMMs for industrial/embedded systems installed in high-reliability and mission-critical environments. All modules are manufactured, tested and validated by ATP, according to the equivalent specifications and testing/validation processes of the respective Micron part number.

“Micron is dedicated to maximizing customers’ infrastructure investments by ensuring prolonged support for legacy systems and applications. Our proven partnership with ATP gives our customers the benefit of receiving similar Micron products and services to support their current platforms while ATP ensures the stability of their operations well into the future.” - Kris Baxter, Corporate Vice President and General Manager, Embedded Business Unit, Micron Technology, Inc.



Legacy (SDR/DDR) DRAM Modules

Under a license agreement with Micron Technology, Inc. signed in August 2015, ATP will continue to manufacture legacy SDR/DDR DRAM modules for Micron’s customers who are unable to migrate. The agreement was expanded in 2016 with the addition of selected legacy DRAM modules specifically for customers using AMD Embedded/Geode platforms. ATP works closely and exclusively with Micron to transfer module designs and extend long-term support to offer the legacy modules in selected form factors (SO-DIMM, UDIMM and RDIMM) and densities, along with ATP’s unique services and features.

The license agreement stipulates the following conditions for ATP:

- 100% follow Micron’s design. Offer extended support for these legacy products to minimize the customer’s (re)qualification efforts.
- 100% follow Micron’s BOM selection. Implement the same specifications for key components (such as IC configuration and Register/PLL type), as well as passive components (such as resistors, capacitors and EEPROM) to meet the specifications of Micron’s BOM.
- 100% follow Micron’s firmware settings. Implement SPD in addition to the manufacturer’s information.
- 100% follow Micron’s specifications. Each module will be manufactured to the equivalent specifications and test processes of the corresponding Micron part number.

Product Information

Module Type	Capacity	Function	Frequency	Number of Pins	PCB Height
DDR SO-DIMM	128 MB / 256 MB / 512 MB / 1 GB	Unbuffered Non-ECC	400 MHz	200	1.25"
DDR SO-DIMM (Industrial Grade)	256 MB / 512 MB	Unbuffered Non-ECC	400 MHz	200	1.25"

Build To Order (BTO)					
Module Type	Capacity	Function	Frequency	Number of Pins	PCB Height
DDR UDIMM	256 MB / 512 MB	Unbuffered Non ECC	400 MHz	184	1.25"
SDRAM SO-DIMM	64 MB / 128 MB / 256 MB	Unbuffered Non ECC	133 MHz	144	1.0" / 1.25"

ATP DRAM Modules: Tested Rigorously for Maximum Reliability

Dynamic Random Access Memory (DRAM) modules perform critical tasks for rigid workloads. Many of them are installed in systems that work non-stop in high-stress environments. They are constantly exposed to thermal, environmental as well as electro-mechanical challenges. Knowing that any vulnerability that can cause unstable system operation can also drastically impact business operations, ATP goes through extra lengths to make sure that its DRAM modules are extremely reliable.

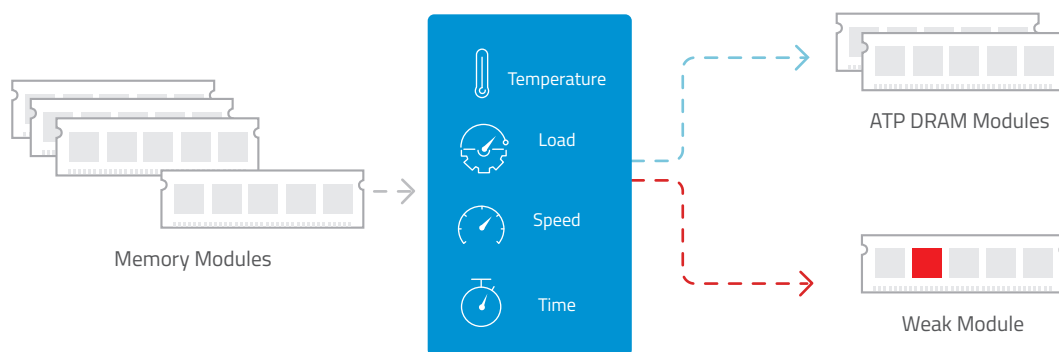
Automatic Test Equipment (ATE)

The ATE detects component defects and structural defects related to the DIMM assembly and screens out marginal timing and signal integrity (SI) sensitivities. ATE provides electrical testing patterns with various parameter settings, such as marginal voltage, signal frequency, clock, command timing and data timing under continuous thermal cycle.



Test During Burn-in (TDBI)

- TDBI at mass production level detects early life failures (ELF) and effectively screens out weak ICs that could fail during the early product life. It combines temperature, load, speed and time to stress test memory modules and expose the weak module.
- Even just 0.01% error on a 99.99% effective device can increase the failure rates at module level and lead to failure in actual usage.
- ATP TDBI can detect and screen out the 0.01% error to ensure utmost reliability.

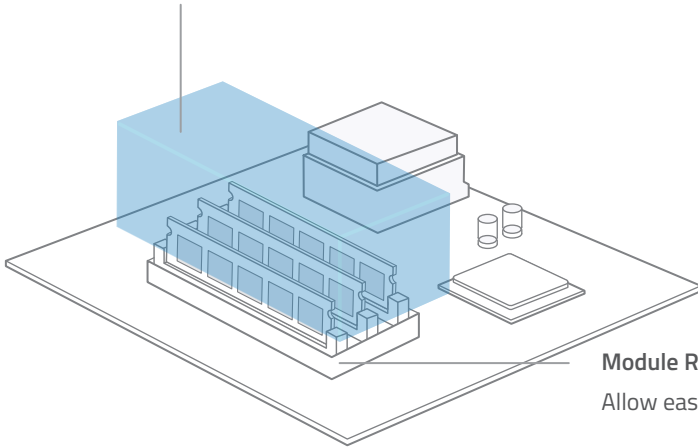


ATP TDBI: What Makes It Unique?

The ATP TDBI system applies extreme high/low temperature, high-low voltage, and pattern testing on DRAM modules. The system consists of:

The Mini Chamber

Isolates temperature cycling only to modules being tested so as not to thermally stress the rest of testing systems. This minimizes the failure of other testing components, such as the motherboards. It also allows faster debug for defects per million (DPM) fallout and reduced false failures. In conventional large thermal chambers, the failures of non-DRAM-related testing components are constant, given that the whole system is thermally stressed.



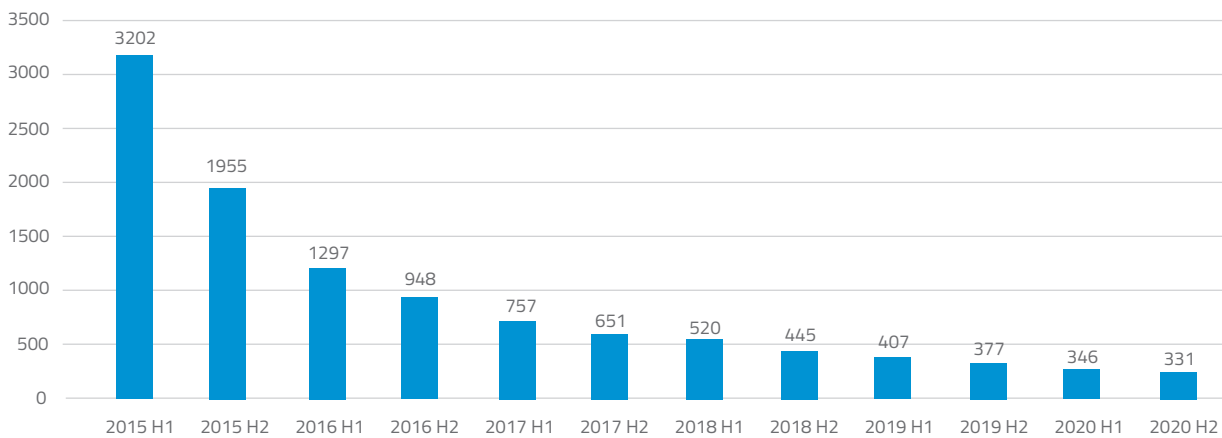
Module Riser Adapters from the Motherboard

Allow easy module insertions in production-level volumes.

Improvements After TDBI Adoption

The following graph shows that with ATP TDBI, the error rates decrease over time. The acceptable industry limit is 3,500 DPPM,* but with ATP TDBI, the error rate has gone down significantly over the years.

DPPM* Summary



*DPPM = Defective Parts per Million

Complete DRAM Portfolio

Product	DIMM Type	Capacity	Speed (MT/s, up to)	VLP/ULP*	30µ" Golden Finger	ATP TDBI	Wide Temperature	Anti-Sulfur Resistors	Conformal Coating	PCB Chamfer
DDR4	RDIMM	4 GB to 128 GB	3200	●	●	●	▲	▲	-	▲
	ECC UDIMM	4 GB to 32 GB	3200	●	●	●	▲	▲	▲	▲
	Non-ECC UDIMM	4 GB to 32 GB	3200	●	●	●	▲	▲	▲	▲
	ECC SO-DIMM	4 GB to 32 GB	3200	-	●	●	▲	▲	▲	▲
	Non-ECC SO-DIMM	4 GB to 32 GB	3200	-	●	●	▲	▲	▲	▲
	Mini-RDIMM	4 GB to 16 GB	2400	●	●	●	▲	▲	-	-
	Mini-UDIMM	4 GB to 16 GB	2400	●	●	●	▲	▲	-	-
DDR3	RDIMM	1 GB to 32 GB	1866	●	●	●	▲	▲	-	▲
	ECC UDIMM	1 GB to 16 GB	1866	●	●	●	▲	▲	▲	▲
	Non-ECC UDIMM	1 GB to 16 GB	1866	●	●	●	▲	▲	▲	▲
	ECC SO-DIMM	1 GB to 16 GB	1866	-	●	●	▲	▲	▲	▲
	Non-ECC SO-DIMM	1 GB to 16 GB	1866	-	●	●	▲	▲	▲	▲
	Mini-RDIMM	1 GB to 8 GB	1600	●	●	●	▲	▲	-	-
	Mini-UDIMM	1 GB to 8 GB	1600	●	●	●	▲	▲	-	-
DDR2	ECC UDIMM	1 GB to 2 GB	800	-	●	●	▲	-	-	-
	Non-ECC UDIMM	1 GB to 2 GB	800	-	●	●	▲	-	-	-
	Non-ECC SO-DIMM	256 MB / 1 GB to 4 GB	800	-	●	●	▲	-	-	-
DDR1	Non-ECC UDIMM	256 MB	400	-	●	●	-	-	-	-
	Non-ECC SO-DIMM	128 MB to 512 MB / 1 GB	400	-	●	●	▲	-	-	-
SDRAM	Non-ECC SO-DIMM	64 MB to 256 MB	PC 133	-	●	●	-	-	-	-

▲: Optional

* VLP: height = 0.74"

ULP: height below 0.74"

Flash Solutions

Customizable Storage Solutions for Mission-Critical Applications

ATP's industrial flash products deliver dependable performance, efficient responsiveness, and long usage life to accomplish mission-critical tasks. Customizable* to customers' configurations, they come in different form factors, such as U.2, 2.5" SSDs, M.2 embedded modules, mSATA, CFast, CompactFlash, SD/microSD memory cards, and USB drives for enterprise and industrial applications. They support high-speed interfaces such as SATA 6 Gb/s and the latest NVMe™ protocol on PCIe® interface for reliable, blazing-fast, and future-ready performance. Managed NAND offerings include the automotive/industrial grade e.MMC and NVMe HSBGA SSD, which integrate flash memory and controller into a single package.

* By project support.



Memory Cards

Small Cards, Big Performance for the Intelligent Edge



ATP durable and trustworthy memory cards suit the needs of industrial applications, especially Automation and Energy.

From smart factory to smart delivery, these small, low-power removable storage devices are excellent for surveillance, robotics, point-of-sale (POS) transactions, and handheld computing to swap operating systems (OS) and/or application programs or to extend storage capacity. The small yet ruggedized form factor is IP57/IP67-certified and supports the industrial temperature range (-40°C to 85°C) to assure reliable function in harsh environments.

ATP CFast cards combine the convenient and trusted format of CompactFlash with the speed, capacity and performance of SATA III, while maintaining backward compatibility with other SATA versions. CompactFlash cards in the original IDE/PATA interface continue to enjoy wide usage in industrial and embedded environments due to their durability and rugged build.

Key Differentiators*

- **One Size Does Not Fit All.** Applications for removable storage are so numerous and so varied that off-the-shelf solutions may not be suitable for specific content volumes, security, reliability and endurance requirements. ATP can custom configure firmware and hardware so customers get what they really need.
- **ATP Joint Validation Service.**** Compatibility and function tests are conducted using client's host devices and systems to ensure compatibility.
- **Complete Coverage Rapid Diagnostic Test** includes testing in extreme temperatures to ensure reliable operation from -40°C to 85°C. RDT covers all areas of the storage device including user, firmware and spare areas.
- **Heavy Duty Construction.** Whether manufactured using System in Package (SiP) or Surface Mount Technology (SMT), ATP memory cards are exceptionally robust, resistant to damaging elements such as dust (IP5X/IP6X), humidity/water (IPX7), electrostatic discharge (ESD), extreme temperature, shock/vibration, and more.

* May vary by product and project support.

** Value-added service

SD/SDHC/SDXC Cards



Key Features

- SD Life Monitor
- Dynamic Data Refresh
- Power failure protection
- Industrial temperature
- 100% MP Level Test

SD/SDHC/SDXC					
Product Line	Premium		Superior		
	S800Pi	S700Pi	S700Sc	S650Si	S650Sc
Interface	512 MB to 2 GB, HS mode 4 GB to 8 GB, UHS-I		UHS-I		
Flash Type	SLC	3D Pseudo SLC	3D Pseudo SLC	3D TLC	
Form Factor	SD Card				
Operating Temperature	-40°C to 85°C		-25°C to 85°C	-40°C to 85°C	-25°C to 85°C
Power Loss Protection Options	Firmware Based				
Optional SED Features	-				
Capacity	512 MB to 8 GB	8 GB to 64 GB	8 GB to 64 GB	32 GB to 128 GB	
Performance					
Sequential Read (MB/s) up to	70	95	95	96	
Sequential Write (MB/s) up to	39	62	62	62	
Endurance and Reliability					
Endurance (TBW) ¹ up to	192 TB	512 TB	512 TB	256 TB	
Reliability MTBF @ 25°C	>5,000,000 hours	>3,000,000 hours	>3,000,000 hours	>2,000,000 hours	
Reliability Number of Insertions	20,000 (SDA spec minimum 10,000)				
Others					
Dimensions: L x W x H (mm)	32.0 x 24.0 x 2.1				
Certifications	CE, FCC, UKCA, RoHS				
Warranty	5 years			2 years	

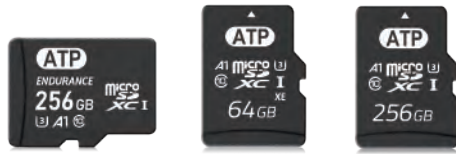
SD/SDHC/SDXC				
Product Line	Superior			
	S600Si	S600Sc	S600Sia	S600Sc
Interface	UHS-I			
Flash Type	3D TLC	MLC	3D TLC	
Form Factor	SD Card			
Operating Temperature	-40°C to 85°C	-25°C to 85°C	-40°C to 85°C	-25°C to 85°C
Power Loss Protection Options	Firmware Based			
Optional SED Features	-			
Capacity	32 GB to 256 GB	4 GB to 64 GB	32 GB to 256 GB	
Performance				
Sequential Read (MB/s) up to	96	87	96	
Sequential Write (MB/s) up to	65	58	65	
Endurance and Reliability				
Endurance (TBW) ¹ up to	307 TB	77 TB	307 TB	
Reliability MTBF @ 25°C	>2,000,000 hours			
Reliability Number of Insertions	20,000 (SDA spec minimum 10,000)			
Others				
Dimensions: L x W x H (mm)	32.0 x 24.0 x 2.1			
Certifications	CE, FCC, UKCA, RoHS			
Warranty	2 years			

Technologies & Add-On Services ²											
Premium	▲	○	○	○	▲	—	○	○	○	○	▲
Superior	▲	○	○	○	○	▲	○	▲	○	○	▲

¹ Under highest Sequential write value. May vary by density, configuration and applications.

² Please refer to pages 45-47. ▲: Customization option available on a project basis.

microSD/microSDHC/ microSDXC Cards



Key Features

- SD Life Monitor
- Dynamic Data Refresh
- Power failure protection
- Industrial temperature
- 100% MP Level Test

microSD/microSDHC/microSDXC					
Product Line	Premium		Superior		
	S800Pi	S700Pi	S700Sc	S650Si	S650Sc
Interface	512 MB to 2 GB, HS mode 4 GB to 8 GB, UHS-I		UHS-I		
Flash Type	SLC	3D Pseudo SLC	3D Pseudo SLC	3D TLC	
Form Factor	microSD Card				
Operating Temperature	-40°C to 85°C		-25°C to 85°C	-40°C to 85°C	-25°C to 85°C
Power Loss Protection Options	Firmware Based				
Optional SED Features	-				
Capacity	512 MB to 8 GB	8 GB to 64 GB	8 GB to 64 GB	32 GB to 256 GB	
Performance					
Sequential Read (MB/s) up to	80	95	95	96	
Sequential Write (MB/s) up to	39	74	74	65	
Endurance and Reliability					
Endurance (TBW) ¹ up to	192 TB	512 TB	512 TB	512 TB	
Reliability MTBF @ 25°C	>5,000,000 hours	>3,000,000 hours	>3,000,000 hours	>2,000,000 hours	
Reliability Number of Insertions	20,000 (SDA spec minimum 10,000)				
Others					
Dimensions: L x W x H (mm)	15.0 x 11.0 x 1.0				
Certifications	CE, FCC, UKCA, RoHS				
Warranty	5 years			2 years	

microSD/microSDHC/microSDXC				
Product Line	Superior			
	S600Si	S600Sc	S600Sia	S600Sc
Interface	UHS-I			
Flash Type	3D TLC	MLC	3D TLC	
Form Factor	microSD Card			
Operating Temperature	-40°C to 85°C	-25°C to 85°C	-40°C to 85°C	-25°C to 85°C
Power Loss Protection Options	Firmware Based			
Optional SED Features	-			
Capacity	32 GB to 256 GB	4 GB to 8 GB	32 GB to 256 GB	
Performance				
Sequential Read (MB/s) up to	96	68	96	
Sequential Write (MB/s) up to	70	24	70	
Endurance and Reliability				
Endurance (TBW) ¹ up to	307 TB	10 TB	307 TB	
Reliability MTBF @ 25°C	>2,000,000 hours			
Reliability Number of Insertions	20,000 (SDA spec minimum 10,000)			
Others				
Dimensions: L x W x H (mm)	15.0 x 11.0 x 1.0			
Certifications	CE, FCC, UKCA, RoHS			
Warranty	2 years			

Technologies & Add-On Services ²											
Premium	▲	○	○	○	▲	—	○	○	○	○	▲
Superior	▲	○	○	○	○	▲	○	▲	○	○	▲

¹ Under highest Sequential write value. May vary by density, configuration and applications.
² Please refer to pages 45-47. ▲: Customization option available on a project basis.

CFast Cards

CFast Card	
Product Line	Premium
	A800Pi
Interface	SATA III 6 Gb/s
Flash Type	SLC
Form Factor	CFast Type I
Operating Temperature	-40°C to 85°C
Power Loss Protection Options	Hardware + Firmware Based
Optional SED Features	-
Capacity	8 GB to 32 GB
Performance	
Sequential Read (MB/s) up to	500
Sequential Write (MB/s) up to	300
Random Reads IOPS (4K, QD32) up to	35,800
Random Writes IOPS (4K, QD32) up to	-
Endurance and Reliability	
Endurance (TBW) ¹ up to	2,667 TB
Reliability MTBF @ 25°C	>2,000,000 hours
Reliability Number of Insertions	10,000 minimum
Others	
Dimensions: L x W x H (mm)	36.4 x 42.8 x 3.6
Certifications	CE, FCC
Warranty	5 years



Key Features

- Advanced wear leveling algorithm
- Bad block management
- AutoRefresh technology
- Power Loss Protection
- S.M.A.R.T support

Technologies & Add-On Services ²									
Premium	○	○	○	○	○	○	○	▲	▲

1 Under highest Sequential write value. May vary by density, configuration and applications.

2 Please refer to pages 45-47. ▲: Customization option available on a project basis.

CompactFlash Cards

CompactFlash Card			
Product Line	Premium	Superior	
	I800Pi	I700Sc	I600Sc
Interface	UDMA 0~4	UDMA 0~6	
Flash Type	SLC	Pseudo SLC	MLC
Form Factor	CF Type I		
Operating Temperature	-40°C to 85°C	0°C to 70°C	
Power Loss Protection Options	Hardware + Firmware Based	Firmware Based	
Optional SED Features	-		
Capacity	512 MB to 32 GB	8 GB to 16 GB	16 GB to 32 GB
Performance			
Sequential Read (MB/s) up to	61	110	108
Sequential Write (MB/s) up to	55	80	46
Endurance and Reliability			
Endurance (TBW) ¹ up to	1,280 TB	128 TB	38 TB
Reliability MTBF @ 25°C	>5,000,000 hours	>2,000,000 hours	
Reliability Number of Insertions	10,000 minimum		
Others			
Dimensions: L x W x H (mm)	36.4 x 42.8 x 3.3		
Certifications	CE, FCC, RoHS		
Warranty	5 years	2 years	



Key Features

- Global wear leveling and bad block management
- AutoRefresh technology
- Power Loss Protection
- Power saving mode
- S.M.A.R.T support

Technologies & Add-On Services ²									
Premium	○	○	○	○	○	○	○	▲	▲
Superior	○	-	○	○	○	-	-	▲	▲

1 Under highest Sequential write value. May vary by density, configuration and applications.

2 Please refer to pages 45-47. ▲: Customization option available on a project basis.

TSE Storage Solutions



Product Name	TSE Storage Solutions
Product Line	SecurStor
Flash Type	MLC
Density	8 GB / 16 GB
Performance Signature time	<150 ms
Interface	UHS-I
Operating Temperature	-25°C to 85°C
Reliability MTBF @ 25°C	>2,000,000 hours
Reliability Number of Insertions	10,000
Dimensions: L x W x H (mm)	15.0 x 11.0 x 1.0

Key Features

- Compliant with the requirements of the BSI TR-03153*, Common Criteria PP-SMAERS, PP-CSP
 - Projected Certificate Validity: Up to 8 years (also available with 5-year validity)
- Form Factors: microSD, SD, USB
- Capacities: 8 GB and 16 GB
- Data Retention: Up to 10 years (depending on test conditions)
- Lifetime: 20 million signatures**
- OS Support: Windows, Android, Linux

* BSI Certification Target: 2022

** May vary on payload size (s)

SecurStor microSD



Product Name	SecurStor microSD
Product Line	SecurStor
Flash Type	MLC
Density	4 GB to 16 GB
Performance Sequential Read (MB/s) up to	10.35
Performance Sequential Write (MB/s) up to	5.3
Interface	UHS-I
Operating Temperature	-25°C to 85°C
Reliability MTBF @ 25°C	>2,000,000 hours
Reliability Number of Insertions	10,000
Dimensions: L x W x H (mm)	15.0 x 11.0 x 1.0

Security Features*

- Multi-Layer Authentication:** Privilege control for up to 10 users offer high levels of protection.
- SecurBoot:** Ensures the integrity and validity of the system's stored BIOS configuration.
- Hardware AES-256 XTS Encryption (SecurEncrypt):** Protects the User Data area with the highest level of hardware encryption without performance trade-off.
- Secure Erase:** Deletes the encryption key to prevent unauthorized retrieval or recovery of the user data.
 - Compliance with US Air Force System Security Instruction (AFSSI) 5020 standard or alike is available on a per-request basis

* Actual availability of specific features may vary by product and capacity. Please contact ATP for details.

Key Features

- Additional AES Key Protection
- Library access possible (MBR required)
- Authentication / Privilege Control
- Total 10 User Accounts can set up privileges individually

Solid State Drives and Modules

Reliable Storage Solutions for the Data Era



ATP flash storage products are built for different workloads, usage scenarios, operating environments and platforms. Hard-wired for sustained operation in wide temperatures (-40°C to 85°C) and other environmental challenges, they may also be customized according to customers' requirements.* They are guaranteed to deliver outstanding performance, rugged durability, and many years of reliable performance. They support the latest high-speed NVMe™ protocol on a PCIe® 3.1 x4 interface as well as proven interfaces such as SATA 6 Gb/s and USB. Various form factors include U.2, 2.5" SSDs, M.2, mSATA and eUSB modules.

Key Differentiators*

- **Configurable Solutions.** ATP SSDs meet diverse embedded/industrial workloads and applications. Customers can use the Online SSD Configuration Tool (<https://www.atpinc.com/ssd-configuration>) to choose their specifications for available parameters or submit a request to build a custom SSD that will best fit their requirements.
- **Customizable FW/HW Thermal Management.** Currently available for high-density NVMe and SSDs, customizable solutions combine firmware and hardware technologies to overcome overheating challenges in high-speed and high-performance storage. By understanding the performance criteria, user application and system specifications, ATP can offer tailor-fitted solutions to deliver improved sustained performance.
- **High-Performance, High-Density Storage in Compact Form Factors.** ATP M.2 and mSATA modules deliver power-packed performance and massive storage capacity in lean footprints, making them ideal for space-restricted systems such as embedded/IPCs, point-of-sale (POS), and networking systems.
- **MCU-Based Power Loss Protection (PLP).*** NVMe modules and selected SATA SSDs feature a completely new design of the PLP array, which utilizes a new power management IC (PMIC) and new firmware-programmable MCU (microcontroller unit). Integrated into its latest PLP technology, the new MCU design allows the PLP array to perform intelligently in various temperatures, power glitches and charge states.
- **End-to-End Data Path Protection.** ATP industrial SSDs incorporate End-to-End Data Path Protection technology to ensure the integrity of data during transfers from the host system to the storage device and back by detecting and correcting errors on multiple transfer points.

* May vary by product and project support.

M.2 NVMe



Key Features

- MCU-based Power Loss Protection Design *
- Self-Encrypting Drive (SED) with AES 256-bit Encryption, TCG OPAL 2.0*
- Thermal Management Solutions**
- End-to-End Data protection
- TRIM function support

* May vary by product and project support
 ** Customization available on a project basis.

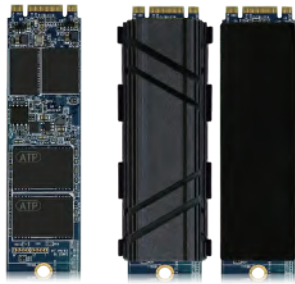
M.2 NVMe				
Product Line	Premium		Superior	
	N750Pi	N700Pi	N650Si	N650Sc
Interface	PCIe G3 x4			
Flash Type	3D TLC (pSLC mode)		3D TLC	
Form Factor	M.2 2280-D2-M			
Operating Temperature (Tcase) ¹	-40°C to 85°C		-40°C to 85°C	0°C to 70°C
Power Loss Protection Options	Hardware + Firmware Based		Hardware + Firmware Based or Firmware Based	
Optional SED Features	AES 256-bit Encryption, TCG Opal 2.0			
Capacity	40 GB to 320 GB	40 GB to 640 GB	120 GB to 960 GB	
Performance				
Sequential Read (MB/s) up to	3,150		3,420	
Sequential Write (MB/s) up to	2,670	2,820	3,050	
Random Reads IOPS up to	147,789 (4K, QD32)		222,700 (4K, QD32)	
Random Writes IOPS up to	114,227 (4K, QD32)		176,600 (4K, QD32)	
Endurance and Reliability				
Endurance (TBW) ² up to	16,000 TB	21,300 TB	4,640 TB	
Reliability MTBF @ 25°C	>2,000,000 hours			
Others				
Dimensions: L x W x H (mm)	80.0 x 22.0 x 3.5 (M.2 2280 Bare PCBA) 80.0 x 24.4 x 12.5 (M.2 2280 with 8 mm heatsink)			
Certifications	CE, FCC, BSMI, UKCA, RoHS, REACH			
Warranty	5 years		2 years	

M.2 NVMe		
Product Line	Superior	
	N600Si	N600Sc
Interface	PCIe G3 x4	
Flash Type	3D TLC	
Form Factor	M.2 2280-D2-M	
Operating Temperature (Tcase) ¹	-40°C to 85°C	0°C to 70°C
Power Loss Protection Options	Hardware + Firmware Based or Firmware Based	
Optional SED Features	AES 256-bit Encryption, TCG Opal 2.0	
Capacity	120 GB to 1,920 GB	
Performance		
Sequential Read (MB/s) up to	3,420	
Sequential Write (MB/s) up to	3,050	
Random Reads IOPS up to	225,200 (4K, QD32)	
Random Writes IOPS up to	179,200 (4K, QD32)	
Endurance and Reliability		
Endurance (TBW) ² up to	5,585 TB	
Reliability MTBF @ 25°C	>2,000,000 hours	
Others		
Dimensions: L x W x H (mm)	80.0 x 22.0 x 3.5 (M.2 2280 Bare PCBA) 80.0 x 24.4 x 12.5 (M.2 2280 with 8 mm heatsink)	
Certifications	CE, FCC, BSMI, UKCA, RoHS, REACH	
Warranty	2 years	

Technologies & Add-On Services ³											
Premium	○	○	○	○	○	○	▲	○	○	▲	▲
Superior	○	○	○	○	○	○	▲	○	▲	▲	▲

1 Case Temperature, the composite temperature as indicated by SMART temperature attributes.
 2 Under highest Sequential write value. May vary by density, configuration and applications.
 3 Please refer to pages 45-47. ▲: Customization option available on a project basis.

High-Capacity M.2 NVMe



Key Features

- Superior Read/Write performance
- LDPC & RAID Data Recovery for error correction
- Thermal Management Solutions*
- Global wear leveling
- TRIM function support
- End-to-End Data Protection

* Customization available on a project basis

High-Capacity M.2 NVMe		
Product Line	Superior	
	N600Si ³	N600Sc
Interface	PCIe G3 x4	
Flash Type	TLC	
Form Factor	M.2 2280-D2-M	
Operating Temperature (Tcase) ¹	-40 °C to 85 °C	0 °C to 70 °C
Power Loss Protection Options	Firmware Based	
Optional SED Features	-	
Capacity	3.84 TB	
Performance		
Sequential Read (MB/s) up to	2,200	2,700
Sequential Write (MB/s) up to	1,250	1,500
Random Reads IOPS (4K, QD128) up to	195,000	195,000
Random Writes IOPS (4K, QD128) up to	170,000	170,000
Endurance and Reliability		
Endurance (TBW) ² up to	10,600 TB	
Reliability MTBF @ 25 °C	>2,000,000 hours	
Others		
Dimensions: L x W x H (mm)	80.0 x 22.0 x 3.5 (M.2 2280 Bare PCBA) 80.0 x 24.4 x 12.5 (M.2 2280 with 8 mm heatsink)	80.0 x 22.0 x 3.5 (M.2 2280 Bare PCBA) 80.0 x 24.4 x 12.5 (M.2 2280 with 8 mm heatsink)
Certifications	RoHS, VCCI, CE, FCC	
Warranty	2 years	

Technologies & Add-On Services ⁴												
Superior	○	○	○	○	○	○	▲	▲	○	○	▲	▲

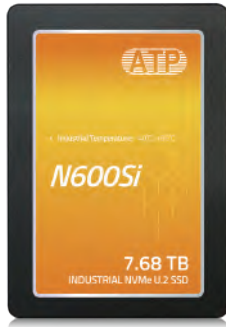
1 Case Temperature, the composite temperature as indicated by SMART temperature attributes.

2 Under highest Sequential write value. May vary by density, configuration and applications.

3 Data subject to change

4 Please refer to pages 45-47. ▲: Customization option available on a project basis.

High-Density Thermal U.2 NVMe



Key Features

- Thermal Management Solutions*
- High-Capacity NVMe Drive
- LDPC & RAID Data Recovery
- End-to-End Data Protection
- S.M.A.R.T / TRIM / Global Wear Leveling

* Customization available on a project basis

U.2 SSD	
Product Line	Superior
	N600Si
Interface	PCIe G3 x4
Flash Type	TLC
Form Factor	2.5"
Operating Temperature (Tcase) ¹	-40 °C to 85 °C
Power Loss Protection Options	Hardware + Firmware Based
Optional SED Features	AES 256-bit Encryption, TCG Opal 2.0
Capacity	960 GB to 7.68 TB
Performance	
Sequential Read (MB/s) up to	3,100
Sequential Write (MB/s) up to	1,400
Random Reads IOPS (4K, QD128) up to	190,000
Random Writes IOPS (4K, QD128) up to	168,000
Endurance and Reliability	
Endurance (TBW) ² up to	21,000 TB
Reliability MTBF @ 25 °C	>2,000,000 hours
Others	
Dimensions: L x W x H (mm)	100.0 x 69.85 x 7.0
Certifications	RoHS, VCCI, CE, FCC
Warranty	2 years

Technologies & Add-On Services ³												
Superior	○	○	○	○	○	○	○	○	○	○	▲	▲

¹ Case Temperature, the composite temperature as indicated by SMART temperature attributes.

² Under highest Sequential write value. May vary by density, configuration and applications.

³ Please refer to pages 45-47. ▲: Customization option available on a project basis.