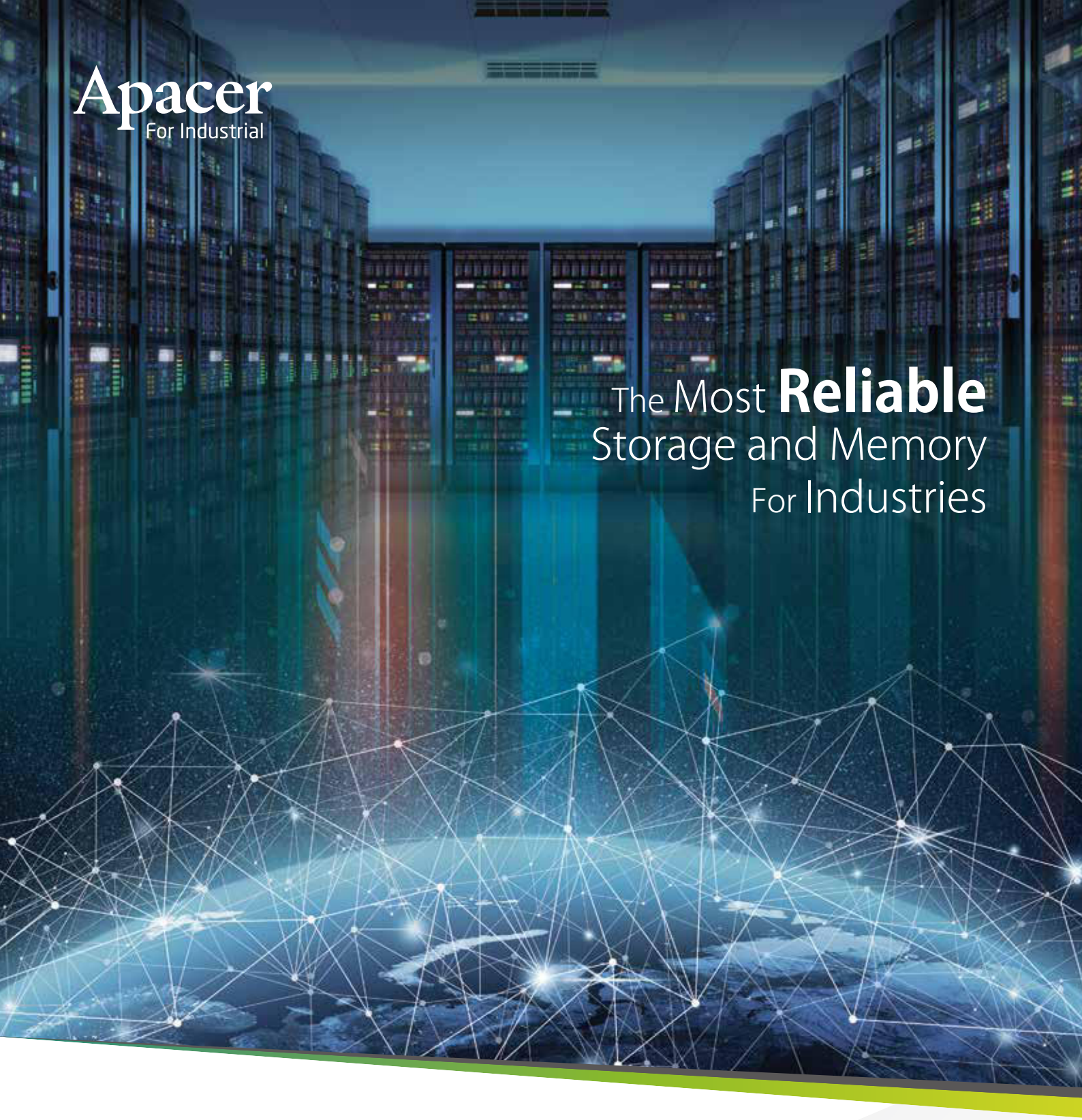
Apacer
For Industrial



The Most **Reliable** Storage and Memory For Industries

Server & Networking Solutions

industrial.apacer.com

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What Sets Apacer Apart?

Professional Technique

- Strong HW/FW engineering know-how
- Customized design with a variety of solutions
- State-of-the-art technology

Quality Assurance

- **100% reliable & compliant**
  - Wide temperature test
  - Thermal shock test
  - Strict ORT (Ongoing Reliability Test)
  - Power cycle test
  - Humidity test
  - Altitude test
  - Reliability test (Vibration/Shock)

Extensive Experience

- Tier 1 industrial SSD & memory supplier; delivered over 135 million units
- Comprehensive experience in product customization (across industries)

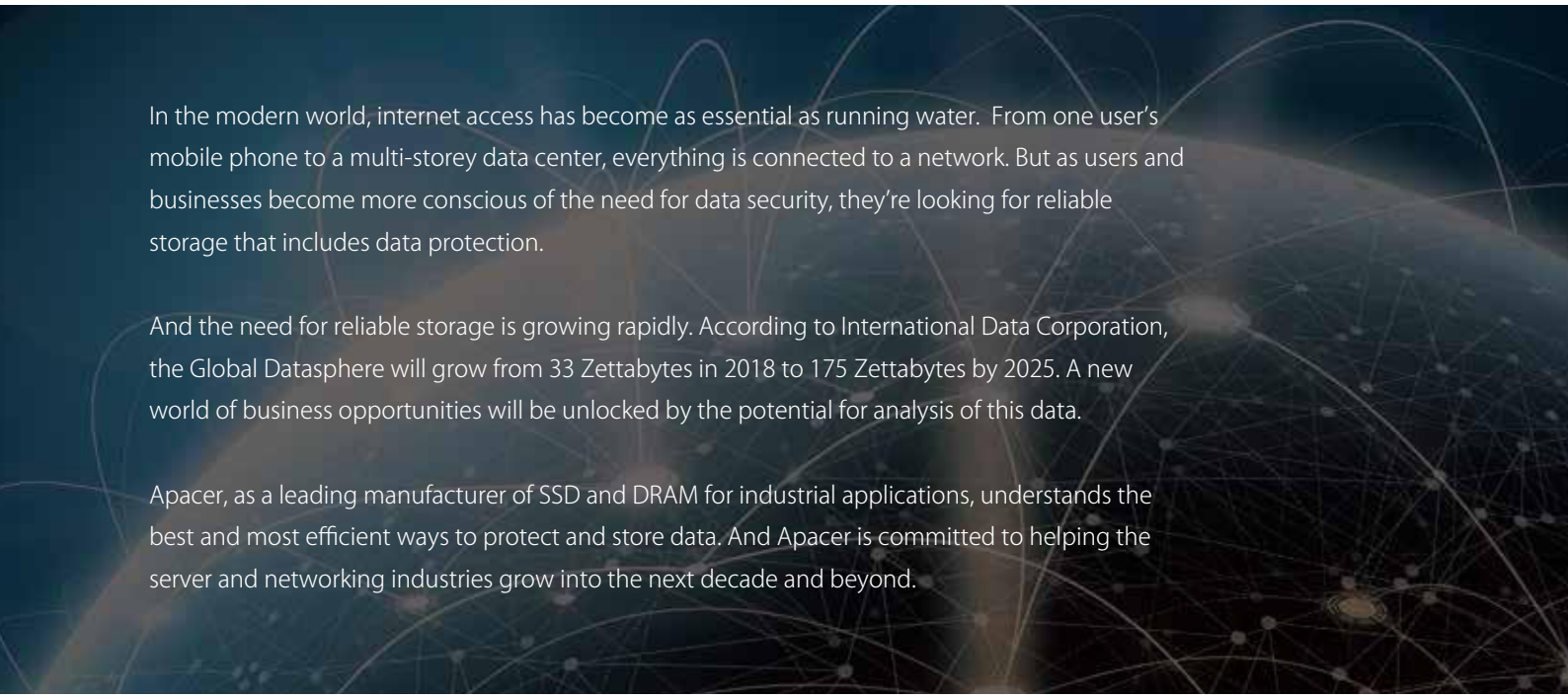
Reliable Service

- Fixed BOM solution
- Longevity of supply, EOL & LTB notice
- Manufacturing in Taiwan protects IP

Trustworthy Supplier

- A global-scale service and maintenance system
- Responsive local FAE technical support
- 24/7 flexible and quick delivery service
- Complete RMA system

Challenges and Requirements for Server and Networking Applications



In the modern world, internet access has become as essential as running water. From one user's mobile phone to a multi-storey data center, everything is connected to a network. But as users and businesses become more conscious of the need for data security, they're looking for reliable storage that includes data protection.

And the need for reliable storage is growing rapidly. According to International Data Corporation, the Global Datasphere will grow from 33 Zettabytes in 2018 to 175 Zettabytes by 2025. A new world of business opportunities will be unlocked by the potential for analysis of this data.

Apacer, as a leading manufacturer of SSD and DRAM for industrial applications, understands the best and most efficient ways to protect and store data. And Apacer is committed to helping the server and networking industries grow into the next decade and beyond.

Hardware That Runs In Harsh Environments

Since the internet is everywhere, the hardware that supports it needs to be able to run everywhere, too. Server and networking components need to be tough enough to survive more punishing environments.

Longer Lifespans Even for Write-Intensive Operation

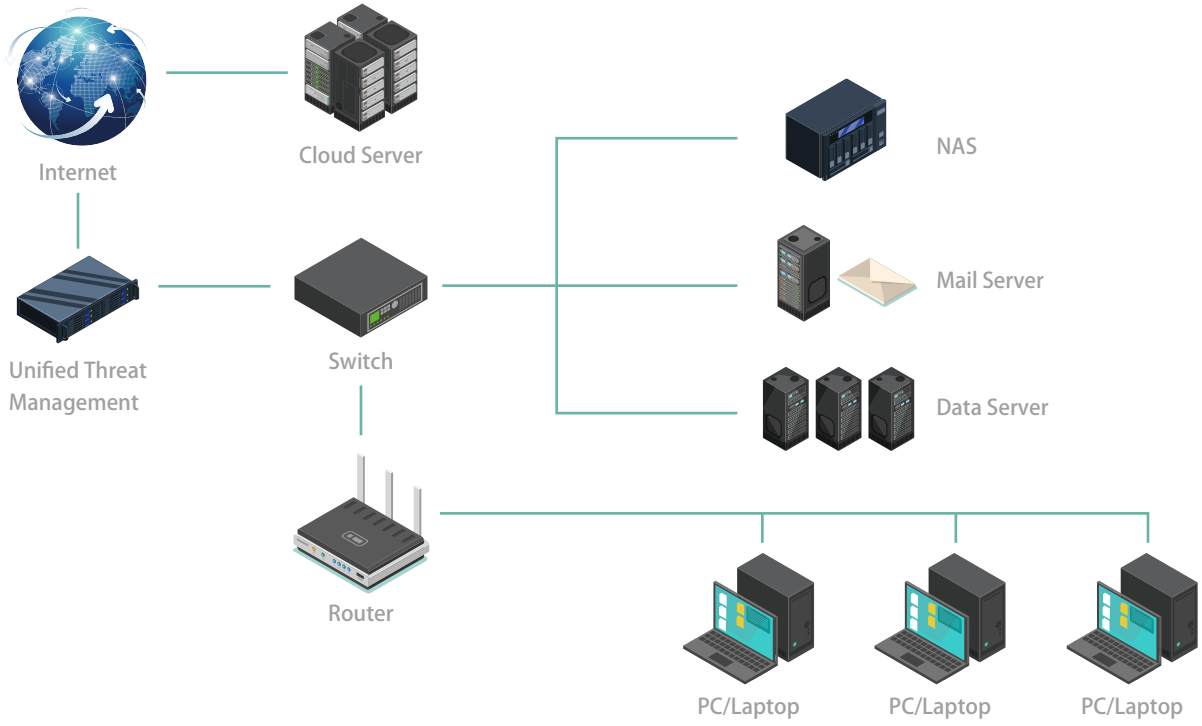
Highly active networks involve a large amount of write operations for small packets of data. Apacer offers value-adding technologies that can allocate resources in the most efficient configurations for these kinds of situations, extending the operational lifetime of networked devices.

Helping You Find The Ideal Solution

Some networks struggle when their workload changes drastically over time. Apacer uses complex data usage analysis to help customers find the most suitable solution for their needs, even if that means a very flexible solution that can handle abnormal or unusual changes in workload.

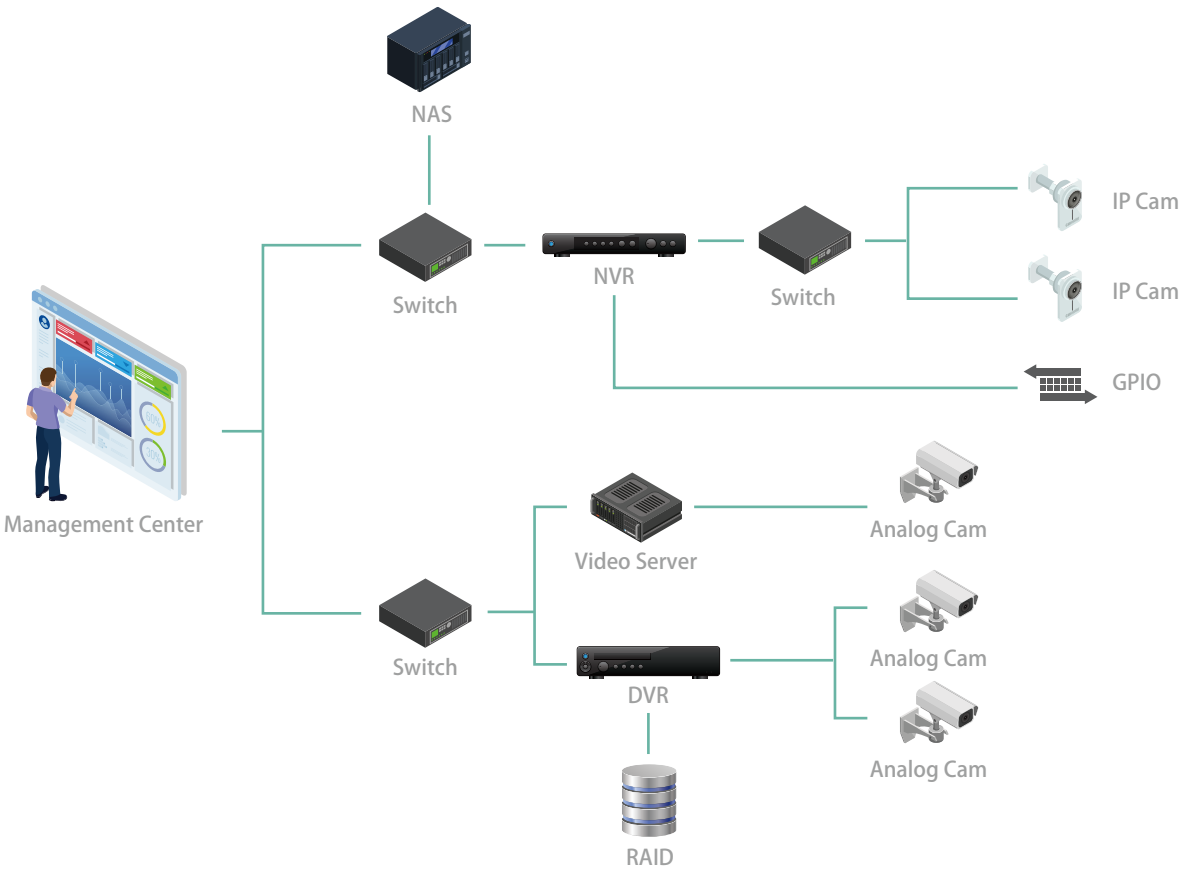
Network Applications: Industrial and Enterprise

Corporate networks often contain confidential databases that can only be accessed by certain authorized users. This is why more comprehensive networking infrastructure is required for corporations, such as mail server encryption, firewalls, NAS and other additional features of data protection.



Network Applications: Surveillance

Both households and corporations are investing in surveillance, including intruder detection technologies, real-time IP camera monitoring and security footage storage. A centralized data storage solution allows archival and retrieval of security footage and associated metadata at the press of a button.



Featured Technologies for Server and Networking Applications

As one of the innovators in the field of industrial storage and memory, Apacer is committed to offering a wide range of industrial-grade SSD and DRAM solutions and cutting-edge technologies featuring multiple approaches to protection.

Endurance

- Over-Provisioning
- SLC-lite
- CoreLife

Security

- TCG Opal 2.0

Performance

- Page Mapping

Extreme Environments

- Wide Temperature
- Conformal Coating
- Nano Coating
- Anti-Sulfuration

Reliability

- DataRAID™
- CorePower
- Thermal Throttling
- End-to-End Data Protection

Value-Added Application

Double-barreled Solution

- CoreAnalyzer2
- SSDWidget 2.0

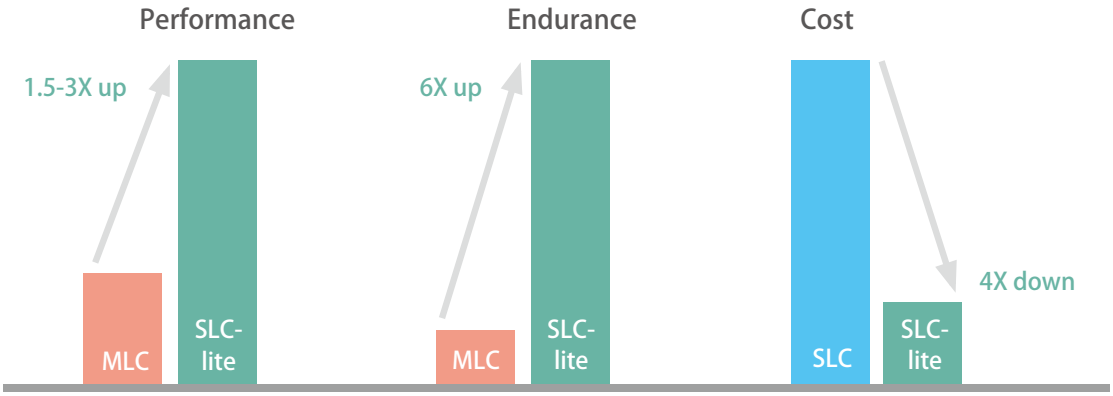
Endurance

Over-Provisioning

To reduce write amplification and increase endurance and performance, Apacer's SSDs support over-provisioning. The SSDs set aside a certain portion of the physical capacity of the memory to carry out garbage collection, wear-leveling and bad block mapping operations. The end result is a longer operating lifetime for our SSD products.

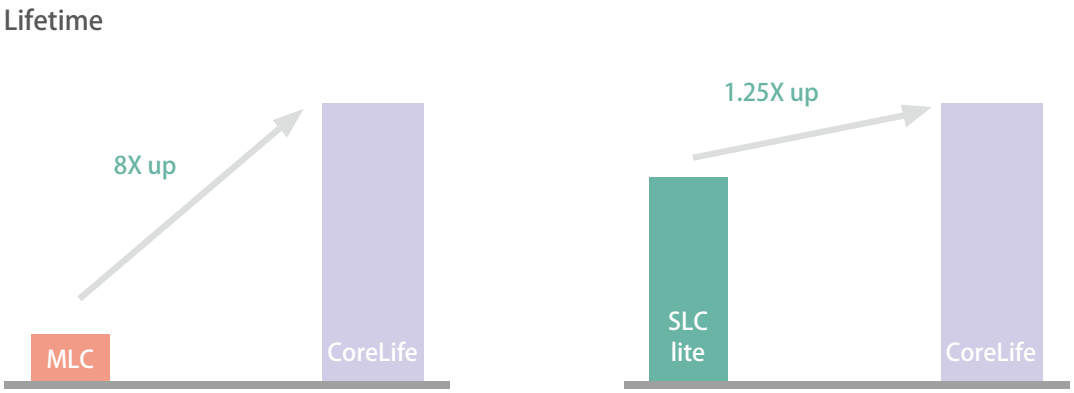
SLC-lite

SLC-lite is Apacer's proprietary technology that strikes a cost-performance balance between MLC and SLC flash types, making it an ideal alternative solution for mission-critical embedded or industrial applications.



CoreLife

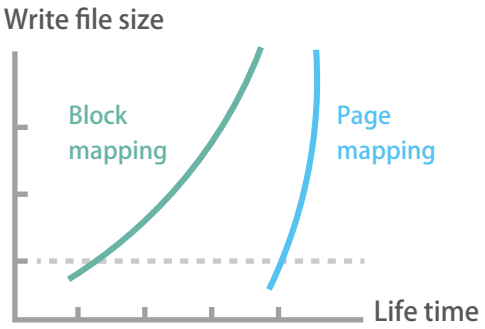
CoreLife technology extends the lifetime of SSDs up to 8 times and provides SSD with excellent consistent random write performance through the exclusive optimized SLC-lite firmware and auto-adjusting NAND technology.



Performance

Page Mapping

Page mapping is an advanced flash management technology which distributes the data into flash pages to allow the data to be evenly written. This way, random access speed will be increased. Also, it reduces the block erasing frequency.



Reliability

DataRAID™

Apacer's DataRAID™ algorithm applies an additional level of protection and error-checking. Using this algorithm, a certain amount of space is given over to aggregating and resaving the existing parity data used for error checking. So, in the event that data becomes corrupted, the parity data can be compared to the existing uncorrupted data and the content of the corrupted data can be rebuilt.

CorePower

Apacer's hardware-based technology is designed to prevent data loss and ensure the stability of data transmission during a power outage by implementing backup power supply that allows sufficient time to move all cached data to NAND flash.

CorePower Circuit

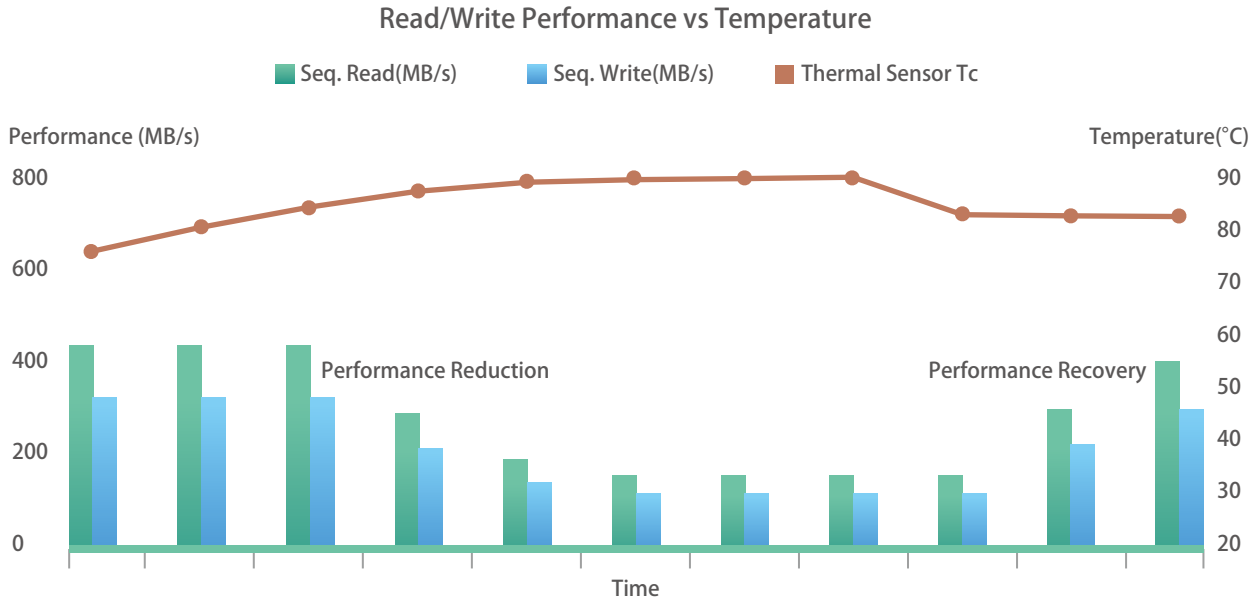
Detect

Backup Power

- SSD will stop receiving host commands
- Detect IC will inform controller to move all the cached data into NAND
- Capacitors start working - backup power supply

Thermal Throttling

To prevent overheating, Apacer equips SSD products with a built-in thermal sensor to monitor the temperature of the SSD via S.M.A.R.T commands and configures the drive with firmware deployment of thermal throttling to manage the device temperature when responding to increased temperature conditions.



End-to-End Data Protection

Apacer's End-to-End Data Protection is a feature implemented in Apacer SSD products that extends error control to cover the entire path from the host computer to the drive and back, and ensure data integrity at multiple points in the path through error-checking techniques including CRC, ECC and DataRAID™ to enable reliable data transfer.

Security

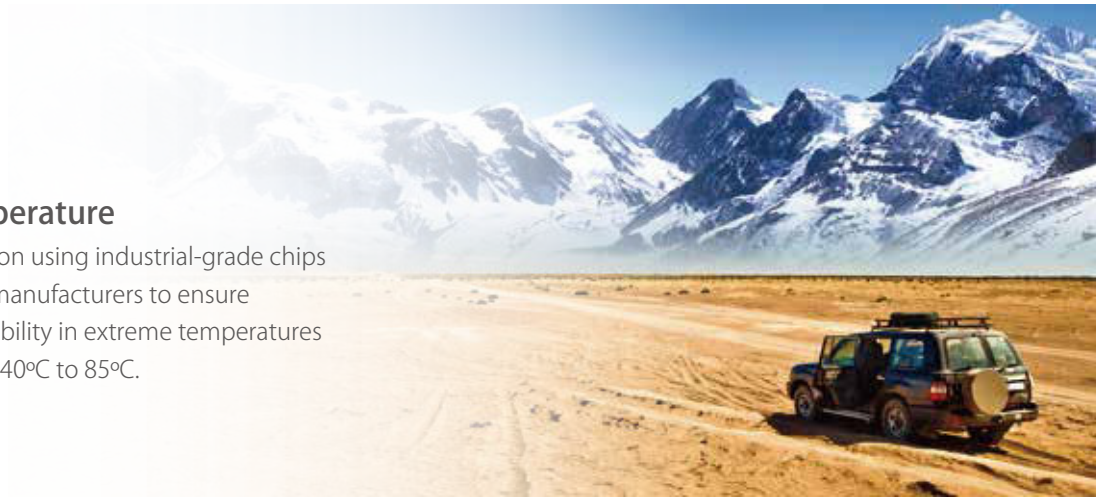
TCG Opal 2.0

Advanced encryption mechanism for data security

Apacer has stepped in with TCG Opal-compliant SSDs as the demand for more invincible data security solutions gives self-encrypting drives (SEDs) a strong foothold in the industrial SSD market.

- AES 256-bit encryption
- 100 % hardware encryption
- Fast data encryption
- Pre-boot authentication
- LBA range assignment

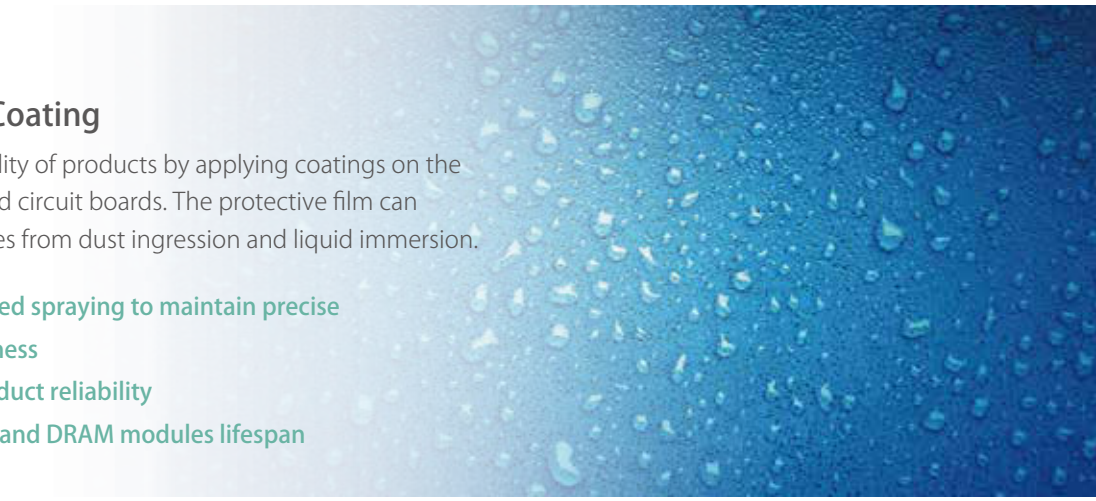
Extreme Environments



Temperature

Wide Temperature

Apacer insists on using industrial-grade chips from original manufacturers to ensure operation reliability in extreme temperatures ranging from -40ºC to 85ºC.



Dust / Moisture

Conformal Coating

Enhances reliability of products by applying coatings on the surface of printed circuit boards. The protective film can safeguard devices from dust ingression and liquid immersion.

- Uses automated spraying to maintain precise coating thickness
- Enhances product reliability
- Prolongs SSD and DRAM modules lifespan

IP57

Nano Coating

The IP57 waterproof and dustproof Nano Coating (parylene conformal coating) solution is especially ideal for SSD modules as it provides invulnerable protection for the components on the devices.

	Conformal Coating	Nano Coating
Protection	Dust, moisture, fungus, corrosion	Dust, moisture, fungus, corrosion IP57
Product	Module type w/o housing	Module type w/o housing
Cost	$	$$$
Additional LT	14 Working-days	14 Working-days

Corrosion

Anti-Sulfuration

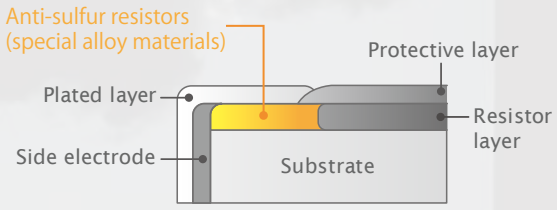
Anti-sulfuration memory modules are mainly used in equipment exposed in highly contaminated environment.

- World's first anti-sulfuration memory modules
- Solves corrosion problems effectively and increases overall system lifespan
- Ensures product reliability and durability
- Widely recognized and awarded patents in many countries

Widely recognized and awarded patents

	Date	No.
China	2019/3/1	201610348460.2
USA	2017/4/11	US9,622,337
Taiwan	2017/9/11	I598878

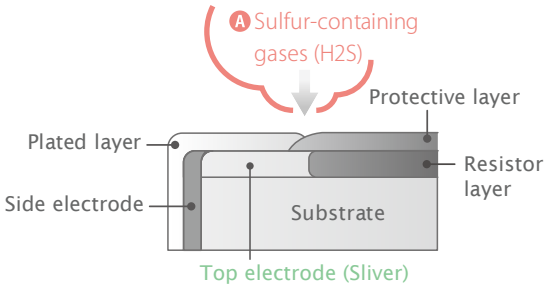
Apacer's anti-sulfuration technology



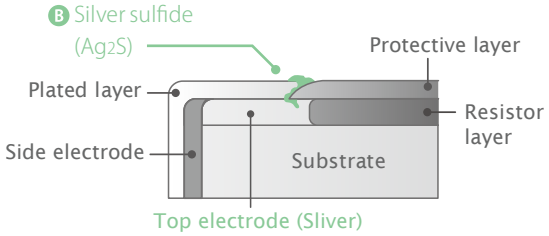
Resistor construction

Apacer has been awarded patents for its anti-sulfuration memory, which prevents sulfur corrosion problems.

Silver sulfide formation



A High concentration of airborne sulfur-containing particles enters gaps in the resistor.



B Silver used in the electrode reacts with sulfur to form silver sulfide (Ag_2S) which is non-conductive, leading to open circuit failure.

Anti-sulfuration technology comparison

	Traditional anti-sulfuration technology	Apacer's anti-sulfuration technology
Method	Covers an sulfur-tolerant layer to protect the electrode	Adopts exclusive and improved alloy materials replace normal electrode
Advantages / Disadvantages	Unstable anti-sulfuration performance due to process failure	Reliable anti-sulfuration performance, improved product reliability and durability

Value-Added Application

Double-barreled Solution

Apacer's Double-barreled Solution extends SSD lifespans, and is comprised of CoreAnalyzer2 and SSDWidget 2.0. CoreAnalyzer2 helps determine which SSD and firmware are most suitable for a customer's application, and SSDWidget 2.0 allows for customers to remotely monitor SSD status in real-time on smartphones or other connected devices, via their private server.

Step 1

CoreAnalyzer2 – Know your application

Choose the most suitable F/W for SSD

Step 2

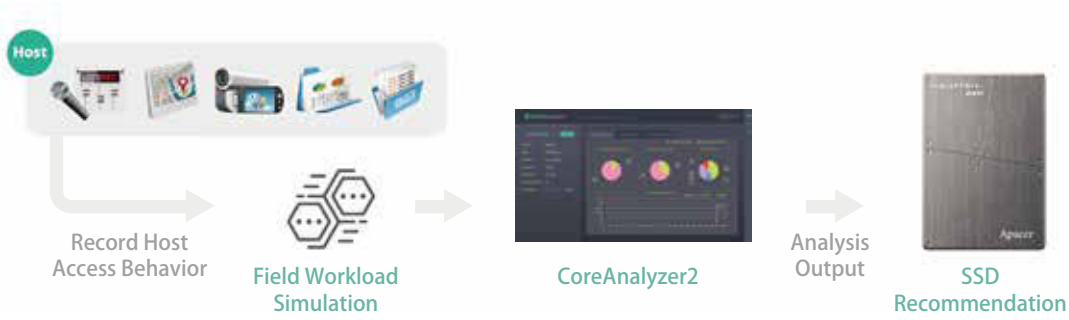
SSDWidget 2.0 – Monitor your SSD Status

Anticipate and mitigate SSD failures remotely

Longer-Lasting SSDs

CoreAnalyzer2

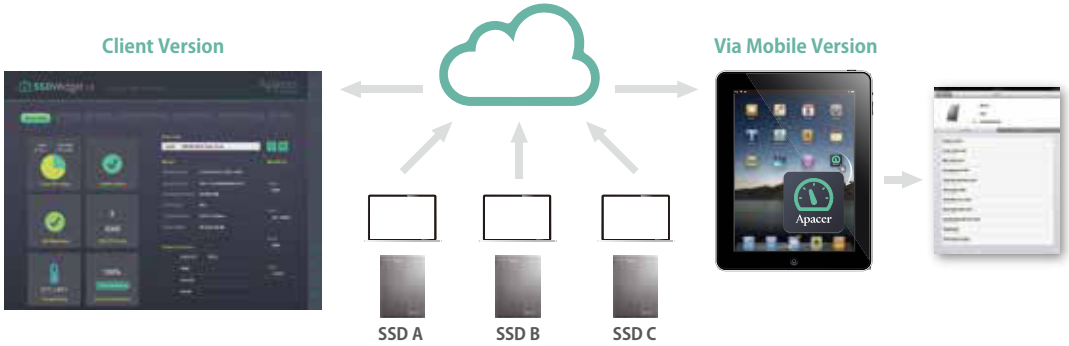
CoreAnalyzer is an exclusive, analytic data-behavior technology integrated with Apacer's SSD products. By collecting and analyzing data from a customer's host system, it can help customers analyze their usage behavior so they can choose the best-suited SSD for their application.



SSDWidget 2.0

Intelligent and comprehensive monitoring and maintaining software

This program features advanced monitoring that allows users to get more detailed read and write records for further use-behavior analysis. The SSD self-test and performance optimization are also included.



Success Story - They Chose Apacer

Challenges

- Intensive write-focused operation with small amounts of data
- Non-standard Linux OS plus need for constant SSD monitoring

Solutions

- SD R1 + DDR3 SODIMM
- SU210-300 + DDR4 ECC SODIMM

Value-added technologies

- **Firmware:** SLC-lite
- **Software:** SSDWidget (customized SDK)

The Customer and the Application: Network Switches

The customer is a leading global manufacturer of networking and communications solutions. Their latest products were network switches which can reduce operational expenses and increase network efficiency. These switches are popular with international telecoms who require a long-term supply, so their products need to be available for support over five to seven years. They came to Apacer for SSDs and DRAM modules, hoping to find a single supplier who could provide them with comprehensive storage options over the coming years.

Challenges

The client informed Apacer's sales team that there were a number of challenges facing them. The first was that due to the nature of network operation, the devices would often be given intensive write-focused tasks. Data would often be written in small amounts but many times, as networked devices exchanged data packets.

The client stated that their operating system would be based on Linux code that they had extensively customized. They also stated that they would need to constantly monitor the operation of SSDs via a Linux-based network. To complicate things even more, there were two products they were developing simultaneously: one using SD cards to store data, and another using an mSATA module. Both products would also need compatible DRAM modules.

Solutions and Technologies

Apacer's engineering team first took a closer look at the specifics of the client's data usage via SSDWidget 2.0. The client's first system involved two SD cards: one for Linux OS booting, and the other for storing log files. They discovered that on the second SD card, the client was using a somewhat outdated data processing technology that wrote data using Block Mapping, which was poorly suited to the write-intensive operation that was required. After some discussion, the engineering team recommended that the client switch to a newer data processing technology that incorporated Smart Read Refresh functionality. This wrote data using Page Mapping, which was more efficient given their data usage behavior.

To allow the client to monitor their SSDs in realtime, Apacer's software team made the SSD Widget 2.0 software development kit (SDK) available to the client. This allowed the client to create a monitoring UI that was compatible with their customized Linux OS, which was far faster and easier for them than creating an SSD monitoring program from scratch. And as the client transitioned from older Block Mapping technology to the newer Page Mapping technology we offered them, they were able to monitor both their old and their new storage solutions to anticipate the end of an SD card's operational lifetime.

In the other product, Apacer's engineering team also examined an mSATA SSD that the client was using, with one partition devoted to Linux OS booting and the other for processing log data. In this case, they suggested that the client switch from MLC to SLC-lite technology, which would provide a better tradeoff of P/E cycles compared to storage size. In this case, too, the client was able to take advantage of access to the SSDWidget 2.0 SDK to develop Linux solutions without starting from scratch.

And, to take full advantage of Apacer's total solution, the client adopted our DDR3 and DD4 modules for their products. These were manufactured using server-grade brand-name ICs sourced directly from the manufacturer. And thanks to Apacer's fixed BOM, the client could rest easy knowing that future orders would be made according to the same precise specifications.

Results and Benefits

The client accepted all of Apacer's suggestions, and after testing the prototypes of the network switches, they found that the operational lifetimes for industrial SSDs were greatly increased. In some cases, SSDs lasted up to three times longer than before, and exhibited consistently superior read-write performance. Apacer's software and firmware teams also expanded their development of the SDK for SSDWidget 2.0, and will put what they've learned to use when creating further iterations of this software.

Additional Support

Longevity

Fixed BOM solution,
EOL & LTB notice

Strong customization capabilities

Strong HW/FW
engineering know-how

Service

Real-time and responsive
after-sales service

Apacer's Strengths

Industrial solutions for
server and networking applications

Double-barreled Solution

Extends lifetimes of
industrial-grade SSDs

Longevity

Fixed BOM support
Unique S/N for
RMA tracking

Strong R&D and customization capabilities

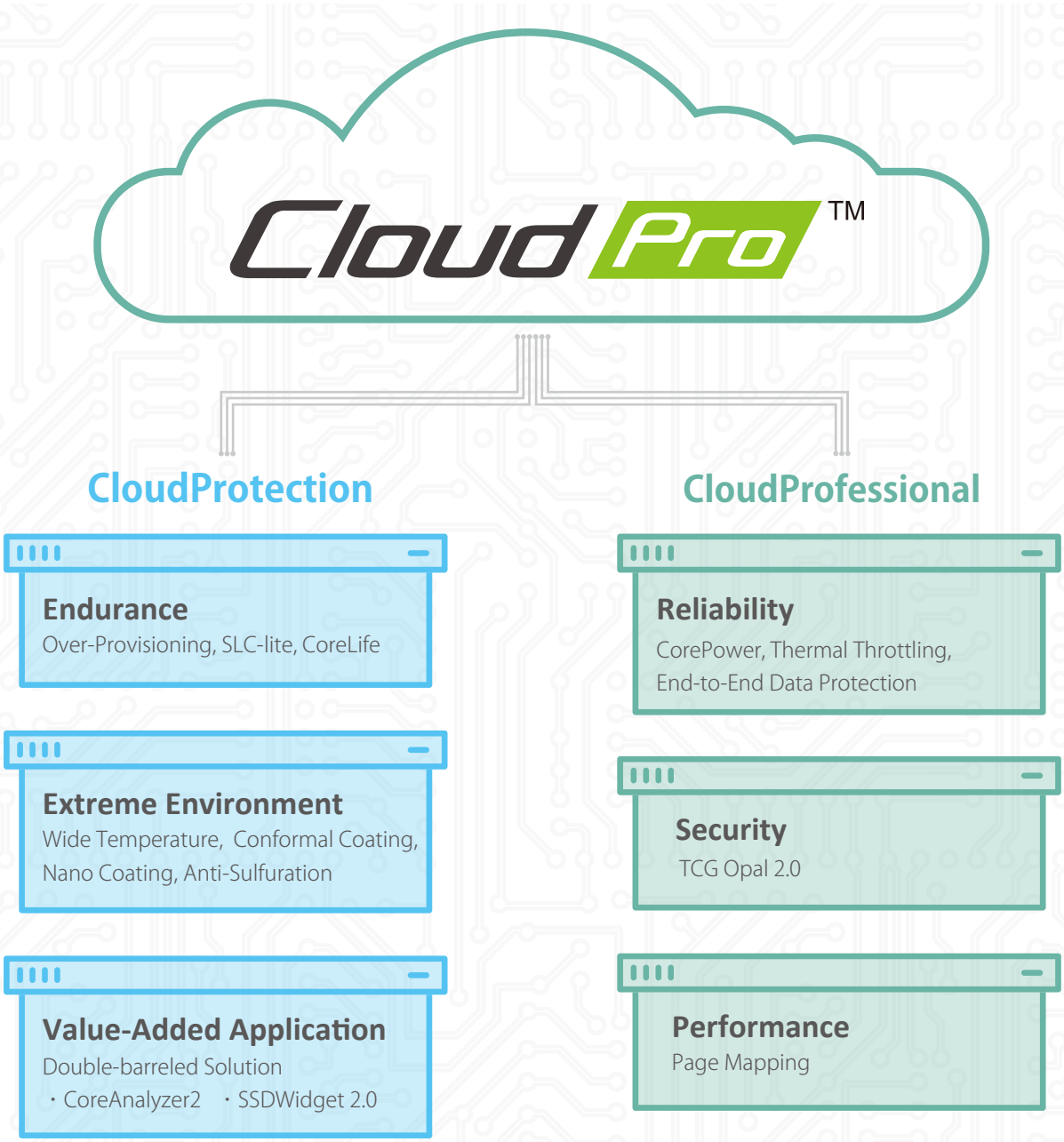
Apacer's Premium Package: CloudPro™

A Tailor-Made Technology Set for Server and Networking Applications

Apacer has developed a tailor-made technology set, "CloudPro™," to meet the multi-faceted requirements of server and networking applications and help customers find the right solutions, further simplifying the process of implementation.

CloudPro™ is classified into two levels based on customers' requirements and Apacer's strong industry background.

- **CloudProtection:** Solves common problems in network applications with enhanced technologies for endurance, extreme environments and value-added applications.
- **CloudProfessional:** Provides more advanced solutions for reliability, data security and performance.



M.2 2280 / M.2 2242

Model	PV310-M280	PV120-M280	PV130-M242	SV250-M280	SM21P-M280	SV250-M242	SU220-M242
Interface	PCIe Gen3 x4	PCIe Gen3 x2	PCIe Gen3 x2	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)
NAND Flash Type	3D TLC	3D TLC	3D TLC	3D TLC	MLC	3D TLC	SLC-lite
Connector	M.2 M key	M.2 B & M key	M.2 B & M key	M.2 B & M key	M.2 B & M key	M.2 B & M key	M.2 B & M key
Form Factor	M.2 2280	M.2 2280	M.2 2242	M.2 2280	M.2 2280	M.2 2242	M.2 2242
Capacity	120GB~960GB	120GB~960GB	60GB~480GB	30GB~960GB	32GB~512GB	30GB~480GB	8GB~128GB
External DRAM	Yes	Yes	No	No	Yes	No	Yes
Sustained Read Performance (MB/sec)	Up to 3200	Up to 1600	Up to 1600	Up to 560	Up to 480	Up to 560	Up to 505
Sustained Write Performance (MB/sec)	Up to 2600	Up to 1000	Up to 1000	Up to 520	Up to 150	Up to 520	Up to 465
Standard Operating Temperature (°C)	0 ~ + 70	0 ~ + 70	0 ~ + 70	0 ~ + 70	0 ~ + 70	0 ~ + 70	0 ~ + 70
Wide Temperature(°C)	-40 ~ +85	-40 ~ +85	-40 ~ +85	-40 ~ +85	-40 ~ +85	-40 ~ +85	-40 ~ +85
Storage Temperature(°C)	-40 ~ +100	-40 ~ +100	-40 ~ +100	-40 ~ +100	-40 ~ +100	-40 ~ +100	-40 ~ +100
Thermal Sensor	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ECC Engine	Low-Density Parity-Check (LDPC) Code	Low-Density Parity-Check (LDPC) Code	Low-Density Parity-Check (LDPC) Code	Low-Density Parity-Check (LDPC) Code	Built-in up to 72-bit per 1K bytes BCH ECC	Low-Density Parity-Check (LDPC) Code	Built-in up to 40-bit per 1K bytes BCH ECC
IOPS (4K Random Write)	300K	180K	180K	75K	40K	75K	80K
Shock	Operation: 50G/11ms (compliant with MIL-STD-202G) Non-operation: 1500G/0.5ms (compliant with MIL-STD-883K)						
Vibration	Operation: 7.69 Grms, 20~2000 Hz/random (compliant with MIL-STD-810G) Non-operation: 4.02 Grms, 15~2000 Hz/sine (compliant with MIL-STD-810G)						
Operating Voltage	3.3 V ± 5%	3.3 V ± 5%	3.3 V ± 5%	3.3 V ± 5%	3.3 V ± 5%	3.3 V ± 5%	3.3 V ± 5%
Dimension (mm)	80.00 x 22.00 x 3.58	80.00 x 22.00 x 3.58	42.00 x 22.00 x 3.60	80.00 x 22.00 x 3.58	80.00 x 22.00 x 3.58	42.00 x 22.00 x 3.60	42.00 x 22.00 x 3.60
MTBF (hours)	>1,000,000	>1,000,000	>1,000,000	>1,000,000	>1,000,000	>1,000,000	>1,000,000
Security	TCG Opal 2.0 / AES-256	TCG Opal 2.0 / AES-256	No	TCG Opal 2.0 / AES-256	No	TCG Opal 2.0 / AES-256	No

2.5" SSD




Model	SV250-25	SM230-25	SU210-25	SS21P-25
Interface	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)
NAND Flash Type	3D TLC	MLC	SLC-lite	SLC
Connector	(7+15) pin male	(7+15) pin male	(7+15) pin male	(7+15) pin male
Form Factor	2.5"	2.5"	2.5"	2.5"
Capacity	30GB~480GB	32GB~1TB	16GB~256GB	32GB~240GB
External DRAM	No	No	Yes	Yes
Sustained Read Performance (MB/sec)	Up to 560	Up to 530	Up to 545	Up to 550
Sustained Write Performance (MB/sec)	Up to 520	Up to 520	Up to 450	Up to 440
Standard Operating Temperature (°C)	0 ~ + 70	0 ~ + 70	0 ~ + 70	0 ~ + 70
Wide Temperature (°C)	-40 ~ +85	-40 ~ +85	-40 ~ +85	-40 ~ +85
Storage Temperature (°C)	-40 ~ + 100	-40 ~ + 100	-40 ~ + 100	-40 ~ + 100
Thermal Sensor	Yes	Yes	Yes	Yes
ECC Engine	Low-Density Parity-Check (LDPC) Code	Built-in 40-bit per 1K bytes BCH ECC	Built-in 72-bit per 1K bytes BCH ECC	Built-in 40-bit per 1K bytes BCH ECC
IOPS (4K Random Write)	74K	65K	80K	76K
Shock	Operation: 50G/11ms (compliant with MIL-STD-202G) Non-operation: 1500G/0.5ms (compliant with MIL-STD-883K)			
Vibration	Operation: 7.69 Grms, 20~2000 Hz/random (compliant with MIL-STD-810G) Non-operation: 4.02 Grms, 15~2000 Hz/sine (compliant with MIL-STD-810G)			
Operating Voltage	5.0 V ± 5%	5.0 V ± 5%	5.0 V ± 5%	5.0 V ± 5%
Dimension (mm)	7mm: 100.00 x 69.85 x 6.90 9.5mm: 100.00 x 69.85 x 9.30	7mm: 100.00 x 69.85 x 6.90 9.5mm: 100.00 x 69.85 x 9.30	7mm: 100.00 x 69.85 x 6.90 9.5mm: 100.00 x 69.85 x 9.30	9.5mm: 100.00 x 69.85 x 9.30
MTBF (hours)	>1,000,000	>1,000,000	>1,000,000	>2,000,000
Security	TCG Opal 2.0 / AES-256	TCG Opal 2.0 / AES-256	No	No

mSATA (MO-300) / SSD Module





Model	SV250-300	SM230-300	SV250-7LP2	SDM5A-M 7P/90D LP2	SDM7-M/SL 7P/180D DP
Interface	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)
NAND Flash Type	3D TLC	MLC	3D TLC	MLC	MLC/SLC-lite
Connector	52-pin	52-pin	7-pin	7-pin	7-pin
Form Factor	JEDEC MO-300	JEDEC MO-300	SDM 7-pin	SDM 7-pin	SDM 7-pin
Capacity	30GB~480GB	32GB~512GB	60GB~240GB	16GB~64GB	16GB~128GB
External DRAM	No	No	No	No	Yes
Sustained Read Performance (MB/sec)	Up to 560	Up to 560	Up to 560	Up to 305	Up to 525
Sustained Write Performance (MB/sec)	Up to 510	Up to 510	Up to 510	Up to 155	Up to 465
Standard Operating Temperature (°C)	0 ~ + 70	0 ~ + 70	0 ~ + 70	0 ~ + 70	0 ~ + 70
Wide Temperature (°C)	-40 ~ +85	-40 ~ +85	-40 ~ +85	-40 ~ +85	-40 ~ +85
Storage Temperature (°C)	-40 ~ + 100	-40 ~ + 100	-40 ~ + 100	-40 ~ + 100	-40 ~ + 100
Thermal Sensor	Yes	Optional	Yes	No	Yes
ECC Engine	Low-Density Parity-Check (LDPC) Code	Built-in 40-bit per 1K bytes BCH ECC	Low-Density Parity-Check (LDPC) Code	Built-in 40-bit per 1K bytes BCH ECC	Built-in 72-bit per 1K bytes BCH ECC
IOPS (4K Random Write)	75K	58K	74K	-	76K
Shock	Operation: 50G/11ms (compliant with MIL-STD-202G) Non-operation: 1500G/0.5ms (compliant with MIL-STD-883K)				
Vibration	Operation: 7.69 Grms, 20~2000 Hz/random (compliant with MIL-STD-810G) Non-operation: 4.02 Grms, 15~2000 Hz/sine (compliant with MIL-STD-810G)				
Operating Voltage	5.0 V ± 5%	5.0 V ± 5%	5.0 V ± 5%	5.0 V ± 5%	5.0 V ± 5%
Dimension (mm)	50.80 x 29.85 x 3.80	50.80 x 29.85 x 3.80	33.00 x 29.30 x 8.85	32.50 x 23.13 x 17.80	30.00 x 32.50 x 7.80
MTBF (hours)	>1,000,000	>1,000,000	>1,000,000	>1,000,000	>1,000,000
Security	TCG Opal 2.0 / AES-256	TCG Opal 2.0 / AES-256	TCG Opal 2.0 / AES-256	No	No

uSSD / SD / CFast / CF





Model	SV170-uSSD	Industrial SD R1	SV250-CFast	SM/U230-CFast	CS710-CF
Interface	SATA 3.0 (6Gb/s)	SD 3.0	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)	PATA
NAND Flash Type	3D TLC	SLC	3D TLC	MLC/SLC-lite	SLC
Connector	BGA 156 Ball	9 pins	(7+17) pin female	(7+17) pin female	50-pin
Form Factor	MO-276	SD	CFast	CFast	CompactFlash Type I
Capacity	30GB~120GB	1GB~16GB	30GB~480GB	8GB~128GB	128MB~64GB
External DRAM	-	-	No	No	No
Sustained Read Performance (MB/sec)	Up to 560	Up to 43	Up to 560	Up to 560	Up to 55
Sustained Write Performance (MB/sec)	Up to 460	Up to 41	Up to 520	Up to 465	Up to 55
Standard Operating Temperature (°C)	0 ~ + 70	0 ~ + 70	0 ~ + 70	0 ~ + 70	0 ~ + 70
Wide Temperature (°C)	-40 ~ +85	-40 ~ +85	-40 ~ +85	-40 ~ +85	-40 ~ +85
Storage Temperature (°C)	-40 ~ + 100	-40 ~ + 100	-40 ~ + 100	-40 ~ + 100	-40 ~ + 100
Thermal Sensor	No	No	Yes	Yes	No
ECC Engine	Low-Density Parity-Check (LDPC) Code	Built-in 43-bit per 1K bytes BCH ECC	Low-Density Parity-Check (LDPC) Code	Built-in up to 72-bit per 1K bytes BCH ECC	Built-in BCH ECC capable of correcting up to 96 bits in 1KB data
IOPS (4K Random Write)	80K	-	75K	41K	-
Shock	Operation: 50G/11ms(compliant with MIL-STD-202G) Non-operation: 1500G/0.5ms(compliant with MIL-STD-883K)				
Vibration	Operation: 7.69 Grms, 20~2000 Hz/random (compliant with MIL-STD-810G) Non-operation: 4.02 Grms, 15~2000 Hz/sine (compliant with MIL-STD-810G)				
Operating Voltage	3.3V ± 5% / 1.8V ± 5% / 1.2V ± 5%	3.3 V ± 5%	3.3 V ± 5%	3.3 V ± 5%	3.3 V / 5.0 V ± 5%
Dimension (mm)	16.00 x 20.00 x 1.40	32.00 x 24.00 x 2.10	42.80 x 36.45 x 3.60	42.80 x 36.45 x 3.60	36.40 x 42.80 x 3.30
MTBF (hours)	>1,000,000	>3,000,000	>1,000,000	>1,000,000	>2,000,000
Security	No	No	TCG Opal 2.0 / AES-256	TCG Opal 2.0 / AES-256	No

RDIMM (ECC Registered DIMM)



Model	DDR4 RDIMM	DDR3 RDIMM	DDR2 RDIMM
Module Type	RDIMM	RDIMM	RDIMM
Memory Technology	DDR4	DDR3	DDR2
Frequency	2133/2400/2666	1066/1333/1600/1866	533/667/800
Density	4G/8G/16G/32G/64G	1G/2G/4G/8G/16G	512M/1G/2G/4G
Voltage	1.2v	1.5v/1.35v	1.8v
Pin Count	288-Pin	240-Pin	240-Pin
Width	72-Bit	72-Bit	72-Bit
PCB Height	1.23"	1.18"	1.18"
Operation Temperature	TC=0℃ to 85℃	TC=0℃ to 85℃	TC=0℃ to 85℃
Value-Added	Thermal Sensor, 30μ Gold Finger, Underfill, Anti-Sulfuration, Conformal Coating	Thermal Sensor, 30μ Gold Finger, Underfill, Anti-Sulfuration, Conformal Coating	30μ Gold Finger, Underfill, Conformal Coating

LRDIMM (Load Reduced DIMM)

Model	DDR4 LRDIMM
Module Type	LRDIMM
Memory Technology	DDR4
Frequency	2133/2400/2666
Density	64G/128G
Voltage	1.2v
Pin Count	288-Pin
Width	72-Bit
PCB Height	1.23"
Operation Temperature	TC=0℃ to 85℃
Value-Added	Thermal Sensor, 30μ Gold Finger, Underfill, Conformal Coating

ECC UDIMM



Model	DDR4 ECC UDIMM	DDR3 ECC UDIMM	DDR2 ECC UDIMM
Module Type	ECC UDIMM	ECC UDIMM	ECC UDIMM
Memory Technology	DDR4	DDR3	DDR2
Frequency	2133/2400/2666	1066/1333/1600/1866	533/667/800
Density	4G/8G/16G	1G/2G/4G/8G/16G	512M/1G/2G/4G
Voltage	1.2v	1.5v/1.35v	1.8v
Pin Count	288-Pin	240-Pin	240-Pin
Width	72-Bit	72-Bit	72-Bit
PCB Height	1.23"	1.18"	1.18"
Operation Temperature	TC=0℃ to 85℃	TC=0℃ to 85℃	TC=0℃ to 85℃
Value-Added	Thermal Sensor, 30μ Gold Finger, Underfill, Wide Temperature, Anti-Sulfuration, Conformal Coating	Thermal Sensor, 30μ Gold Finger, Underfill, Wide Temperature, Anti-Sulfuration, Conformal Coating	30μ Gold Finger, Underfill, Conformal Coating

ECC SODIMM




Model	DDR4 ECC SODIMM	DDR3 ECC SODIMM	DDR2 ECC SODIMM	DDR ECC SODIMM
Module Type	ECC SODIMM	ECC SODIMM	ECC SODIMM	ECC SODIMM
Memory Technology	DDR4	DDR3	DDR2	DDR
Frequency	2133/2400/2666	1066/1333/1600/1866	533/667/800	266/333/400
Density	4G/8G/16G	1G/2G/4G/8G/16G	512M/1G/2G/4G	512M/1G
Voltage	1.2v	1.5v/1.35v	1.8v	2.5v/2.6v
Pin Count	260-Pin	204-Pin	200-Pin	200-Pin
Width	72-Bit	72-Bit	72-Bit	72-Bit
PCB Height	1.18"	1.18"	1.18"	1.25"
Operation Temperature	TC=0℃ to 85℃	TC=0℃ to 85℃	TC=0℃ to 85℃	TA=0℃ to 70℃
Value-Added	Thermal Sensor, 30μ Gold Finger, Underfill, Wide Temperature, Anti-Sulfuration, Conformal Coating	Thermal Sensor, 30μ Gold Finger, Underfill, Wide Temperature, Anti-Sulfuration, Conformal Coating	30μ Gold Finger, Underfill, Conformal Coating	30μ Gold Finger, Underfill, Conformal Coating

VLP UDIMM



Model	DDR4 VLP UDIMM	DDR3 VLP UDIMM	DDR2 VLP UDIMM
Module Type	VLP UDIMM	VLP UDIMM	VLP UDIMM
Memory Technology	DDR4	DDR3	DDR2
Frequency	2133/2400//2666	1066/1333/1600	533/667/800
Density	4G/8G/16G	1G/2G/4G/8G	512M/1G/2G/4G
Voltage	1.2v	1.5v/1.35v	1.8v
Pin Count	288-Pin	240-Pin	240-Pin
Width	64-Bit	64-Bit	64-Bit
PCB Height	0.738"	0.738"	0.72"
Operation Temperature	TC=0℃ to 85℃	TC=0℃ to 85℃	TC=0℃ to 85℃
Value-Added	Wide Temperature, Underfill, Anti-Sulfuration, Conformal Coating	Wide Temperature, Underfill, Anti-Sulfuration, Conformal Coating	Underfill, Conformal Coating

VLP RDIMM


Model	DDR4 VLP RDIMM	DDR3 VLP RDIMM
Module Type	VLP RDIMM	VLP RDIMM
Memory Technology	DDR4	DDR3
Frequency	2133/2400/2666	1066/1333/1600
Density	4G/8G/16G	1G/2G/4G/8G
Voltage	1.2v	1.5v/1.35v
Pin Count	288-Pin	240-Pin
Width	72-Bit	72-Bit
PCB Height	0.738"	0.738"
Operation Temperature	TC=0℃ to 85℃	TC=0℃ to 85℃
Value-Added	Thermal Sensor, 30μ Gold Finger, Underfill, Wide Temperature, Anti-Sulfuration, Conformal Coating	Thermal Sensor, 30μ Gold Finger, Underfill, Wide Temperature, Anti-Sulfuration, Conformal Coating

VLP ECC UDIMM



Model	DDR4 VLP ECC UDIMM	DDR3 VLP ECC UDIMM	DDR2 VLP ECC UDIMM
Module Type	VLP ECC UDIMM	VLP ECC UDIMM	VLP ECC UDIMM
Memory Technology	DDR4	DDR3	DDR2
Frequency	2133/2400/2666	1066/1333/1600	533/667/800
Density	4G/8G/16G	1G/2G/4G/8G	512M/1G/2G
Voltage	1.2v	1.5v/1.35v	1.8v
Pin Count	288-Pin	240-Pin	240-Pin
Width	72-Bit	72-Bit	72-Bit
PCB Height	0.738"	0.738"	0.72"
Operation Temperature	TC=0℃ to 85℃	TC=0℃ to 85℃	TC=0℃ to 85℃
Value-Added	Thermal Sensor, 30μ Gold Finger, Underfill, Wide Temperature, Anti-Sulfuration, Conformal Coating	Thermal Sensor, 30μ Gold Finger, Underfill, Wide Temperature, Anti-Sulfuration, Conformal Coating	30μ Gold Finger, Underfill, Conformal Coating

Mini DIMM



Model	DDR4 Mini RDIMM	DDR3 Mini RDIMM	DDR2 Mini RDIMM
Module Type	(VLP) Mini RDIMM	Mini RDIMM	Mini RDIMM
Memory Technology	DDR4	DDR3	DDR2
Frequency	2133/2400/2666	1066/1333/1600	533/667
Density	4GB/8GB/16GB	1G/2G/4G/8G	512M/1G
Voltage	1.2v	1.5v/1.35v	1.8v
Pin Count	288-Pin	244-Pin	244-Pin
Width	72-Bit	72-Bit	72-Bit
PCB Height	0.738"/1.23"	1.181"	1.181"
Operation Temperature	TC=0℃ to 85℃	TC=0℃ to 85℃	TC=0℃ to 85℃
Value-Added	Thermal Sensor, 30μ Gold Finger, Underfill, Conformal Coating	Thermal Sensor, 30μ Gold Finger, Underfill, Conformal Coating	30μ Gold Finger, Underfill, Conformal Coating

VLP Mini ECC UDIMM


Model	DDR4 VLP Mini ECC UDIMM	DDR3 VLP Mini ECC UDIMM
Module Type	VLP Mini ECC UDIMM	VLP Mini ECC UDIMM
Memory Technology	DDR4	DDR3
Frequency	2133/2400/2666	1066/1333/1600
Density	4G/8G/16G	1G/2G/4G
Voltage	1.2v	1.5v/1.35v
Pin Count	288-Pin	244-Pin
Width	72-Bit	72-Bit
PCB Height	0.738"	0.738"
Operation Temperature	TC=0℃ to 85℃	TC=0℃ to 85℃
Value-Added	Thermal Sensor, 30µ Gold Finger, Underfill, Conformal Coating	Thermal Sensor, 30µ Gold Finger, Underfill, Conformal Coating

SORDIMM



Model	DDR4 SORDIMM	DDR3 SORDIMM	DDR2 SORDIMM
Module Type	(VLP) SORDIMM	SORDIMM	SORDIMM
Memory Technology	DDR4	DDR3	DDR2
Frequency	2133/2400/2666	1066/1333/1600	533/667
Density	4G/8G/16G	1G/2G/4G	512M/1G
Voltage	1.2v	1.35v/1.5v	1.8v
Pin Count	260-Pin	204-Pin	200-Pin
Width	72-Bit	72-Bit	72-Bit
PCB Height	0.738"/1.18"	1.18"	1.18"
Operation Temperature	TC=0℃ to 85℃	TC=0℃ to 85℃	TC=0℃ to 85℃
Value-Added	Thermal Sensor, 30µ Gold Finger, Underfill, Conformal Coating	Thermal Sensor, 30µ Gold Finger, Underfill, Conformal Coating	30µ Gold Finger, Underfill, Conformal Coating

About Apacer

Apacer is a global leader in digital storage solutions devoted to innovative storage technology and services. After 20 years in the industry, we remain dedicated to our belief in "persistence in doing the right things." Our core values, as always, continue to revolve around reliability and innovation.

The company focuses on embedded applications for a variety of vertical markets, including military, medical, gaming, and industrial, and has become an integration expert in digital storage, innovative applications, and value-added services. Apacer is known for its advanced technologies and product quality and was ranked by Gartner as the top industrial SSD supplier for five consecutive years, from 2012 to 2016. In addition, Apacer is committed to making a positive impact on societal issues and has joined the **Responsible Business Alliance (RBA)**, which is formerly known as Electronic Industry Citizenship Coalition (EICC), a coalition promoting **corporate social responsibility (CSR)** within the global electronics supply chain. We believe that the success of a corporation is marked not by profit but by how we benefit others, whether by caring for the environment or making contributions to society.

Compliance and Associations

ISO 9001:2015 | ISO 14001:2015 | OHSAS 18001:2015 | IECQ CQ80000