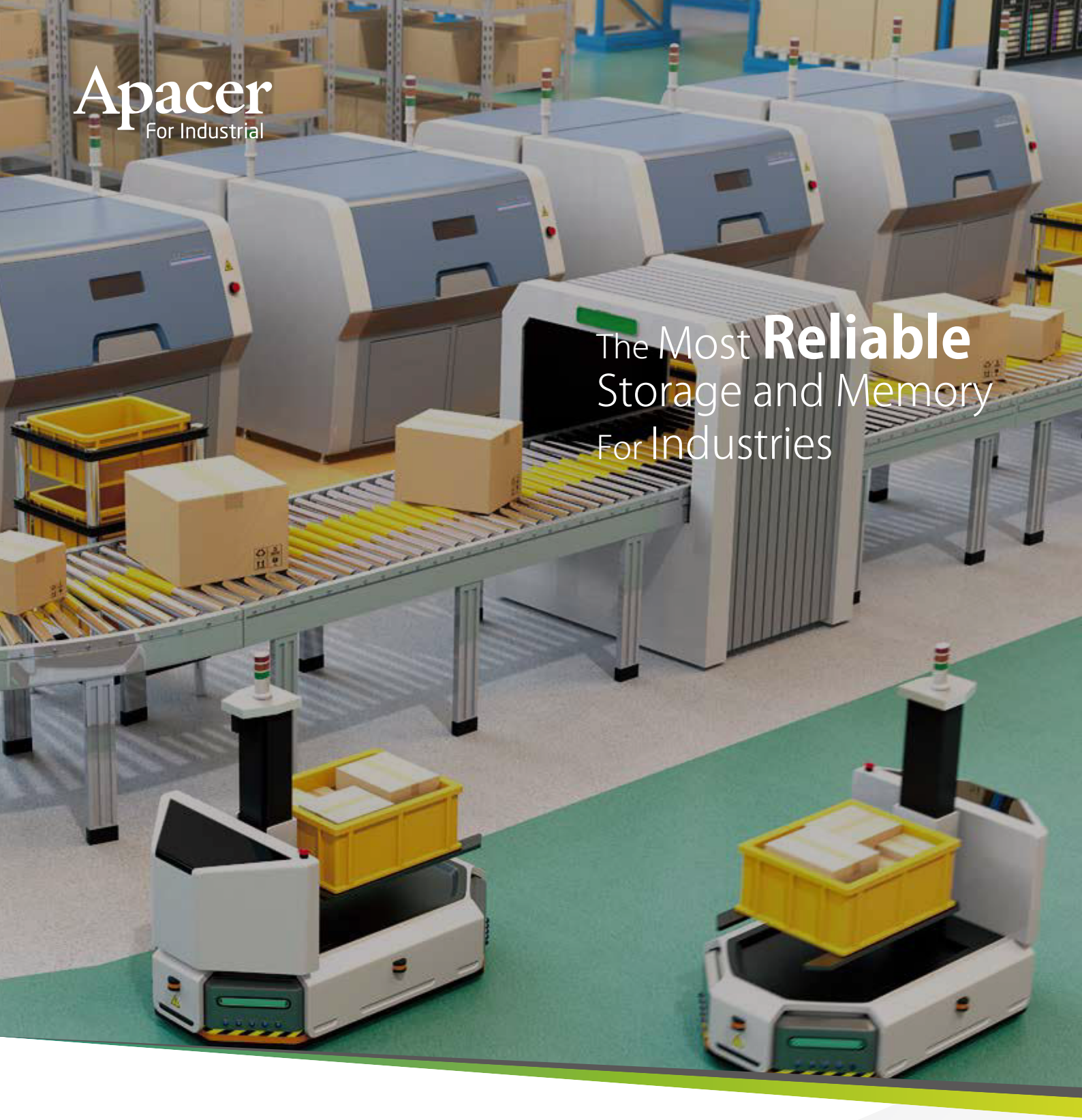
Apacer
For Industrial



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

Factory Automation 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

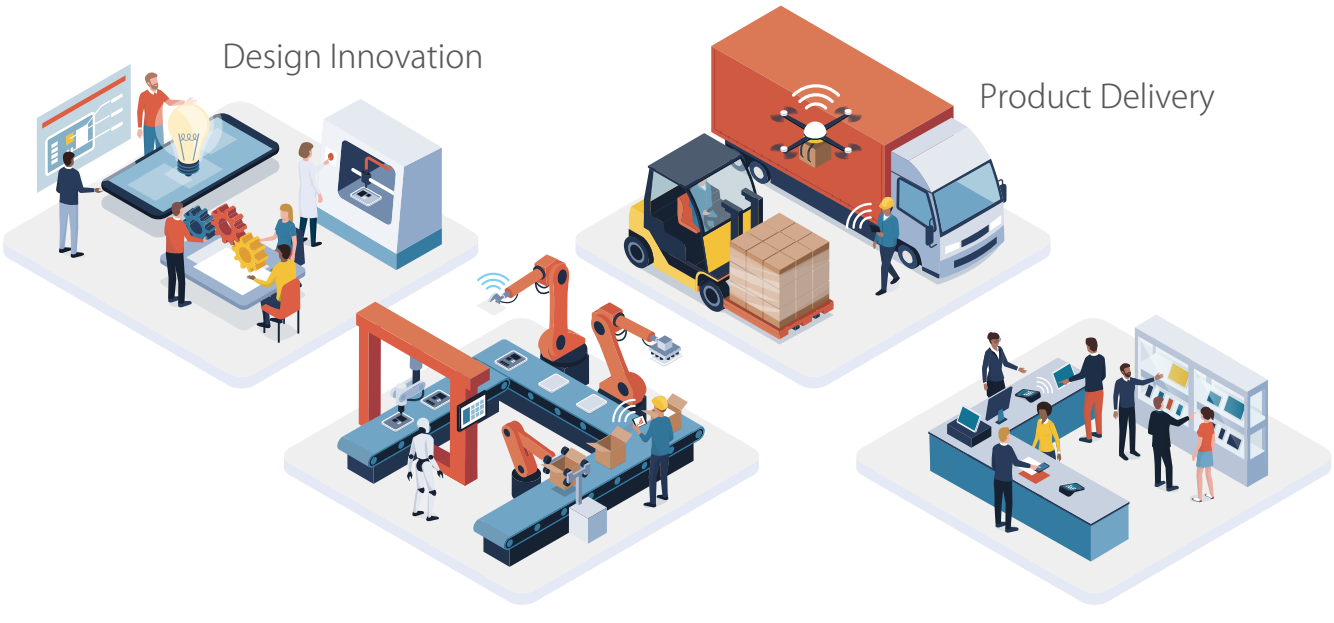
Challenges and Requirements for Factory Automation Applications

The ever-rising cost of labor has become a key concern for manufacturers, especially in the last few decades. Now, as computer-controlled robotics finally come into their own, manufacturers are looking for fast and reliable ways to automate part or all of their manufacturing. The challenge is data – the more production steps that are automated, the more data needs to be collected and analyzed.

Apacer, as a leading industrial manufacturer, is one of the few companies with the experience base required to develop solutions for factory automation. Data integrity is paramount, but it can't come at the sacrifice of speed, because the amount of data being generated is rising so quickly. Apacer's DRAM modules and SSDs deliver the combination of speed and reliability that top manufacturers demand.

In this brochure, we'll take a deeper dive into Apacer's value-adding technologies and reveal how they can help with the coming transfer to full factory automation.

Factory Automation Applications



Challenges and Requirements

Since data gathering and analysis is necessary for constant improvement, the automation industry demands excellent data integrity. Apacer delivers this in spades, thanks to advanced algorithms like DataRAID™, carefully tweaked by our experienced software engineers. Endurance and power stability are also concerns, but again, these are areas in which Apacer's technology excels. Over-provisioning helps extend operational lifetimes, while DataDefender™ prevents data corruption that can occur when power fails unexpectedly. For factories where sulfur or contaminants pollute the air, Apacer offers resistant coatings and patented anti-sulfuration protection. And all the while, the smooth operation of the production facility can be monitored remotely thanks to Apacer's Double-barreled Solution.

Featured Technologies for Factory Automation Applications

Data Integrity

- DataRAID™
- Smart Read Refresh
- End-to-end Data Protection

Longevity

- Over-provisioning
- SLC-lite

Power Stability

- DataDefender™
- CorePower

Survivability

- Wide Temperature
- Conformal Coating
- Nano Coating
- Anti-sulfuration

Value-added Application

- Double-barreled Solution
  - CoreAnalyzer2
  - SSDWidget 2.0

Data Integrity

SMART Read Refresh™

Apacer Smart Read Refresh™ plays a proactive role in avoiding read disturb errors from occurring to ensure the health status of all blocks of NAND flash. Developed for read-intensive applications in particular, Smart Read Refresh™ is employed to make sure that during read operations, when the read operation threshold is reached, the data is refreshed by re-writing it to a different block for subsequent use.

Data Retention

Data retention refers to how long stored data can be maintained while a storage device is powered down. Apacer offers a number of optimization strategies to help customers achieve the ideal balance of data retention with P/E cycles for industrial applications.

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.

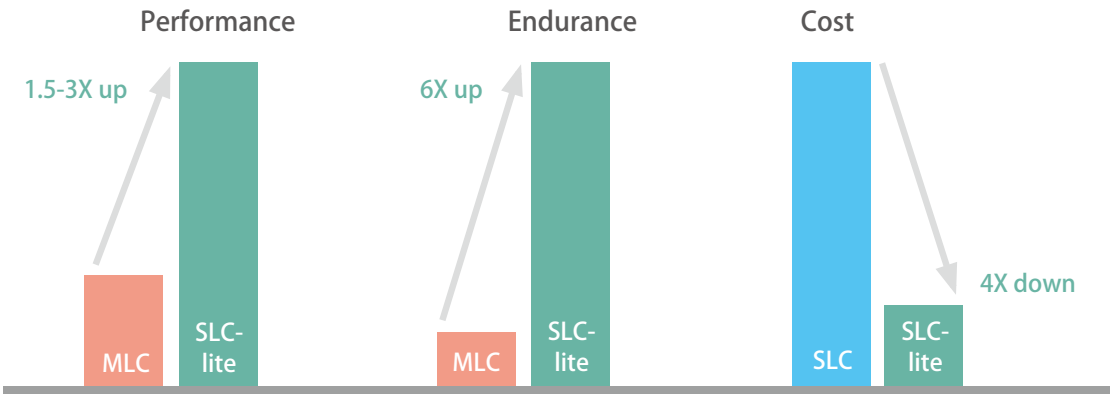
Longevity

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 SSDs.

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.

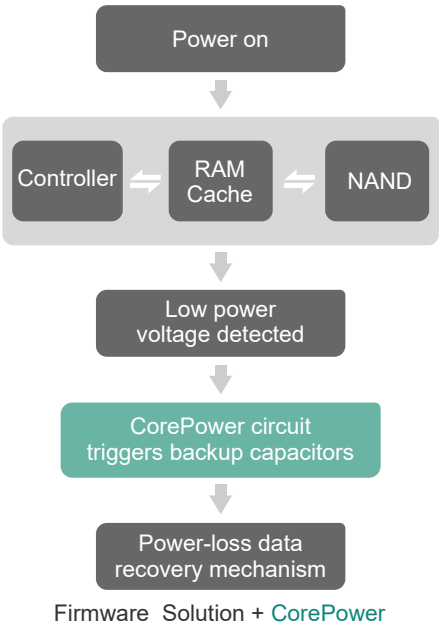


Power Stability

DataDefender™

Apacer DataDefender™ combines both firmware and hardware mechanisms to ensure data integrity.

When power disruption occurs, the hardware mechanism will notice and trigger the controller to run multiple write-to-flash cycles to store data. Then the firmware will check that the data was correctly written to the NAND flash after the power disruption, preventing data loss.



Firmware Solution + CorePower

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 a backup power supply that allows sufficient time to move all cached data to NAND flash.

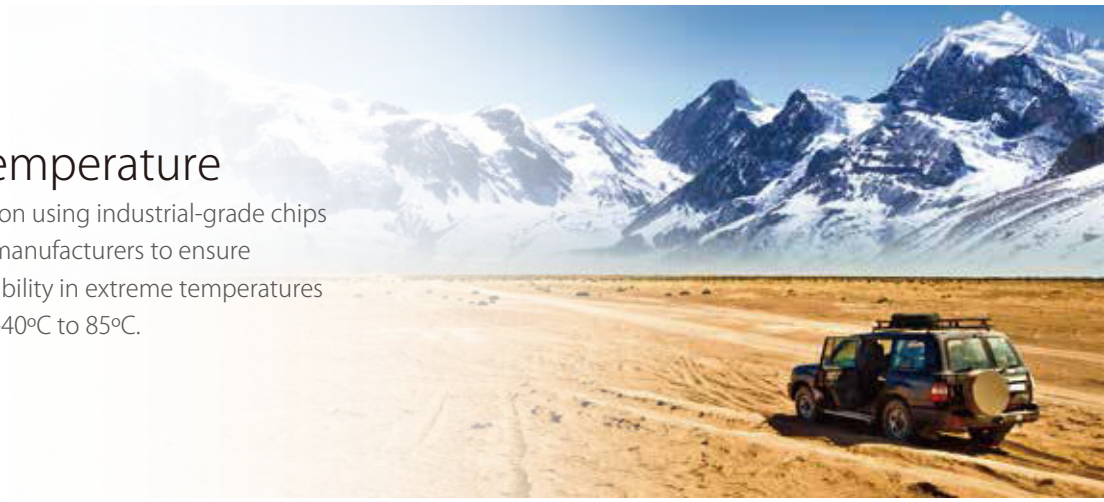
CorePower Circuit

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

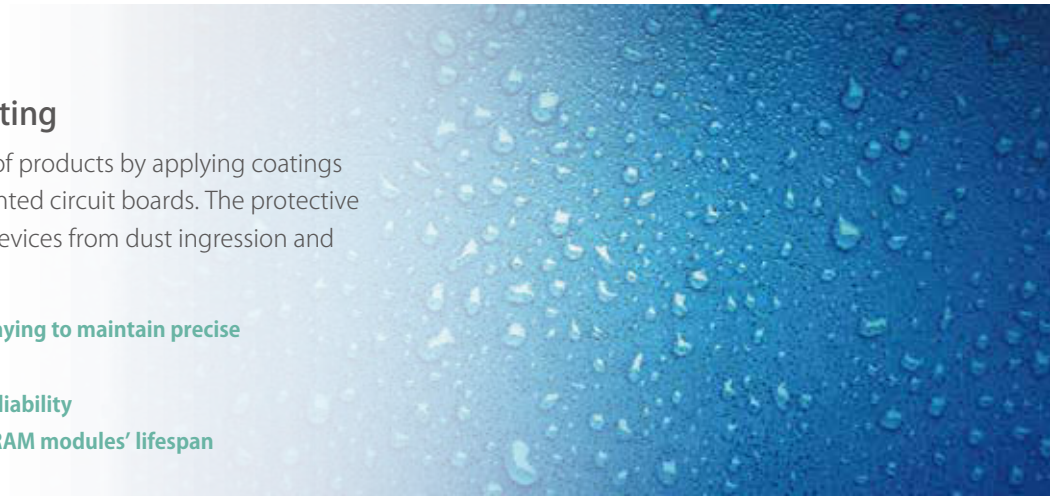
Survivability



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

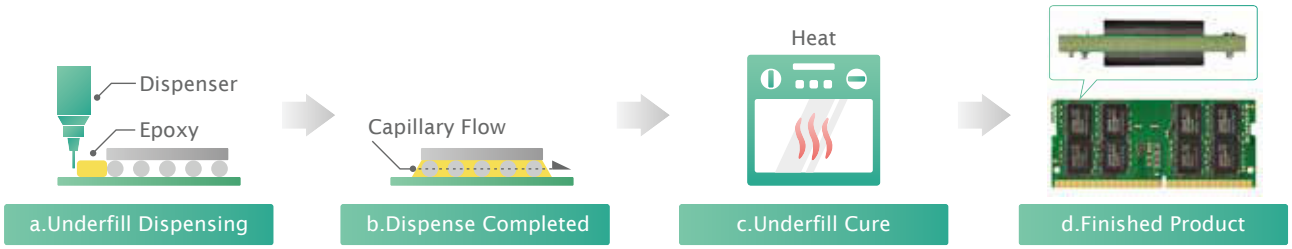
The IP57 waterproof and dustproof Nano Coating (parylene coating) solution is especially ideal for SSD modules as it provides invulnerable protection for the components on the devices.

	Conformal Coating	Nano Coating
Protection	Dust, moisture, fungus, corrosion	Dust, moisture, fungus, corrosion IP57
Cost	$	$$$
Additional LT	14 Working-days	14 Working-days

Underfill

Apacer provides underfill technology to increase product reliability and resistance to various thermal and mechanical shocks.

- Strengthens the solder joints between solder balls and printed circuit board
- Increases the product's resistance against shock and vibration
- Reduces thermal stress damage
- Complies with MIL-STD-810G shock and vibration requirements
- Increases product reliability and lifespan



Anti-sulfuration

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

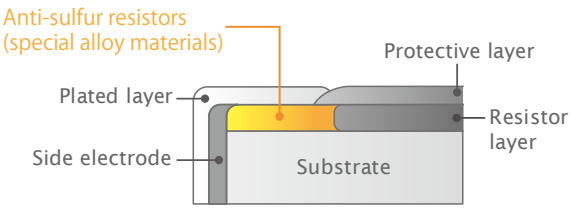
- World's first anti-sulfuration memory modules
- Solve corrosion problems effectively and increase overall system lifespan
- Ensure product reliability and durability

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.

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

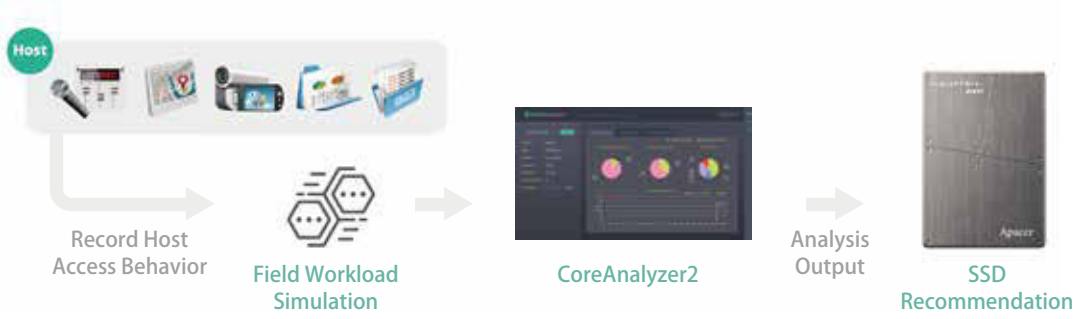
SSDWidget 2.0 – Monitor your SSD Status

Anticipate and mitigate SSD failures remotely

Longer-lasting SSDs

CoreAnalyzer2

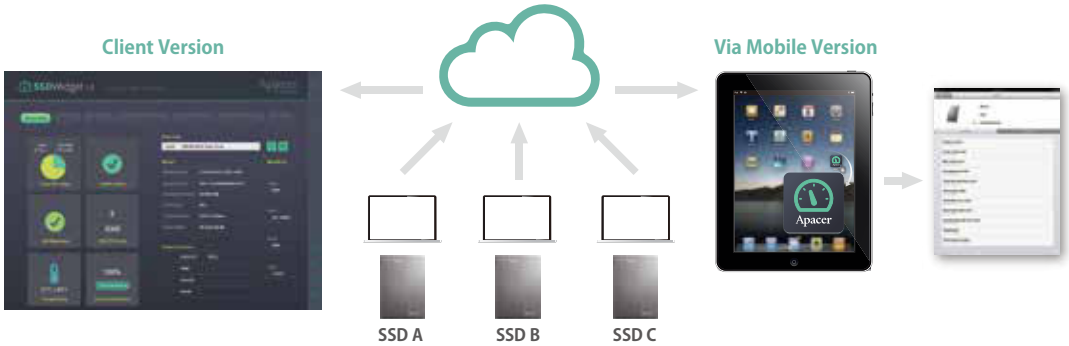
CoreAnalyzer is an exclusive, analytic data-behavior technology integrated with Apacer's SSD products. By collecting and analyzing data from a customer's host system, it can help customers analyze their usage behavior so they can choose the best-suited SSD for their application.



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

- Extremely low tolerance for downtime
- Device operational lifetime has to be up to 10 years
- Polluted environment

Solutions

2.5" SSD SV250-25

Value-added technologies

- **Hardware:**

Conformal coating

- **Software:**

SSDWidget 2.0
CoreAnalyzer2

Implements Apacer DataDefender™ for preventing data corruption due to unexpected power failure

Introduction

Manufacturers around the world are realizing the advantages of factory automation, and investing R&D resources in developing their strengths in this field. In addition to the obvious cost reductions in manpower, the appeal lies in developing reliable production facilities that can function even in adverse environments. But developing truly independent automated facilities requires components with incredible reliability and robust designs. That's where Apacer enters the picture.

The Customer and the Application

A system integrator based in the Asia-Pacific region approached Apacer for assistance with their latest project. They required an ultra-reliable data storage solution for their latest project, which was a food processing system equipped with SCADA technology.

Challenges

This food processing system had to be able to continuously operate around the clock and had an extremely low tolerance for downtime. Yet it was also designed to have an operational lifetime of up to 10 years, so only the most durable components could be chosen. And due to various platform and module restrictions due to legacy hardware and software, the client was concerned about compatibility issues.

Due to the nature of SCADA operation, dynamic data transmission would be necessary at all hours. The client also predicted that voltage instability might be an issue in some locations in the Asia-Pacific region. With all these challenges in mind, Apacer's team of experienced engineers set to work.

Solutions and Technologies

Apacer's engineering team studied the problem closely and came up with some recommendations for the client. First of all, they recommended the client integrate Apacer's Double-barreled Solution into their system. The SSDWidget2.0 application, which is one of the two key elements of the Double-barreled Solution, would allow operators to determine when an SSD was reaching the end of its operational lifetime, and let them replace it before it ceased to function. This way, downtime would be eliminated and data integrity would be maintained. In fact, Apacer's engineering team carried out some software customizations for this client to ensure there would be no compatibility issues.

In order to prevent data corruption due to unexpected power failure, the Apacer team also recommended that the client adopt Apacer's DataDefender™ technology for the project. This power management system is designed to detect any unexpected drops in voltage and perform a safe shutdown if such an event occurs.

And to allow the system to function in challenging environments, the engineering team finally recommended that the client opt for conformal coating treatments. These would prevent damage that might occur if moisture or detritus (such as food particles) came into contact with sensitive components, helping the client's system remain operational longer.

Results and Benefits:

In the end, the client decided to take all of Apacer's recommendations. This resulted in the creation of a durable, trustworthy food processing system that proved resilient enough to function smoothly even after years of continuous use. The client also let Apacer know that their relationships with their downstream buyers were significantly solidified due to the food processing system's durability and resistance to adverse conditions.

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
factory automation applications

Value-added application

Double-barreled Solution

- CoreAnalyzer2
- SSDWidget 2.0

Longevity

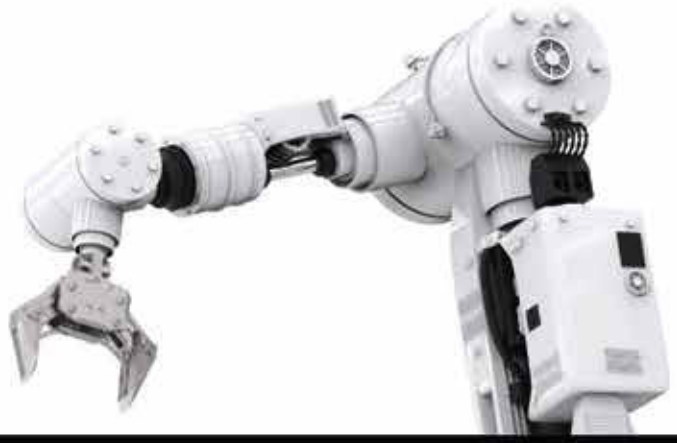
- Fixed BOM support
- Unique S/N for RMA tracking

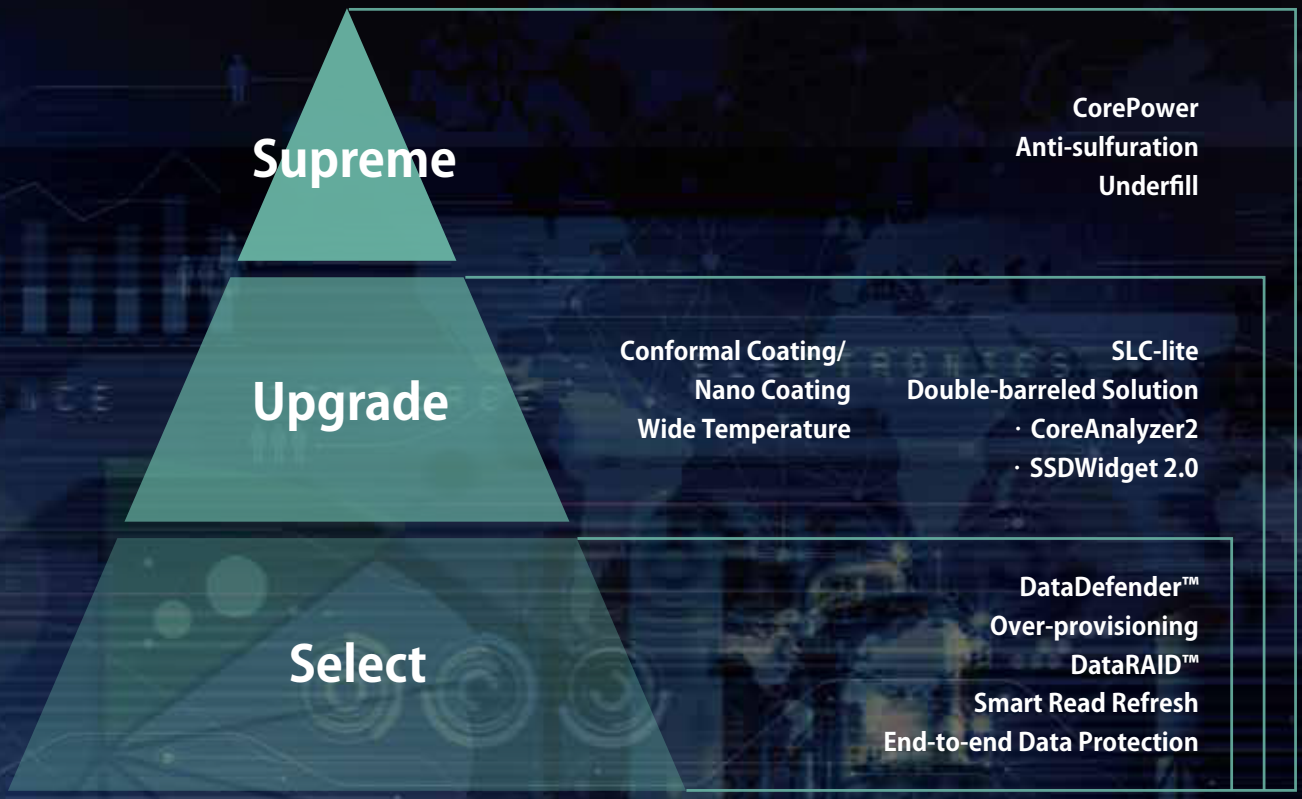
Strong R&D and customization capabilities

Apacer's Premium Package: RoboPro™

A Customized Technology Set for Factory Automation

Factory automation can be an extremely complicated process. With that in mind, Apacer assembled a selection of value-adding technologies into its factory automation technology set, known as RoboPro™. These technologies help deliver the reliability and processing speed that industry leaders demand. RoboPro™ is divided into three levels of sophistication: Select, Upgrade and Supreme, as detailed in the diagram below.





2.5" SATA SSD






Model	SV250-25	SU210-25	SM230-25	SM21P-25	SM210-25	SS21P-25
Interface	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)	SATA 3.1 (6Gb/s)	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)
NAND Flash Type	3D TLC	MLC	MLC	MLC	MLC	SLC
Connector	(7+15) pin male	(7+15) pin male	(7+15) pin	(7+15) pin male	(7+15) pin male	(7+15) pin male
Form Factor	2.5"	2.5"	2.5"	2.5"	2.5"	2.5"
Capacity	30GB~480GB	16GB~256GB	With AES 256 support: 32GB~1TB With TCG Opal 2.0 support: 32GB~512GB	32GB~512GB	32GB~512GB	32GB~240GB
External DRAM	No	Yes	No	Yes	Yes	Yes
EST. Seq R/W Performance (MB/sec)	560/520	545/450	530/520	505/470	510/38	550/440
Standard Operating Temperature (°C)	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
Storage Temperature (°C)	-40 ~ + 100	-40 ~ + 100	-40 ~ + 100	-40 ~ + 100	-40 ~ + 100	-40 ~ + 100
ECC Engine	Low-Density Parity-Check (LDPC) Code	Built-in 40-bit per 1K bytes BCH ECC	Built-in 40-bit per 1K bytes BCH ECC	Built-in 40-bit per 1K bytes BCH ECC	Built-in 40-bit per 1K bytes BCH ECC	Built-in 40-bit per 1K bytes BCH ECC
IOPS (4K Random Write)	74K	80K	65K	81K	79K	76K
Thermal Sensor	Yes	Yes	Yes	Yes	Yes	Yes
Shock	Operation: Acceleration, 50(G)/11(ms)/half sine (compliant with MIL-STD-202G) Non-operation: Acceleration,1,500(G)/0.5(ms)/half sine (compliant with MIL-STD-883K)					
Operating Voltage	5.0 V ± 5%	5.0 V ± 5%	5.0 V ± 5%	5.0 V ± 5%	5.0 V ± 5%	5.0 V ± 5%
Power Consumption	Active mode: 385 mA / Idle mode: 100 mA	Active mode: 560 mA / Idle mode: 75 mA	Active mode: 500 mA / Idle mode: 95 mA	Active mode: 1100 mA / Idle mode: 120 mA	Active mode: 560 mA / Idle mode: 75 mA	Active mode: 500 mA / Idle mode: 95 mA
Dimension (mm)	7mm:100.00 x 69.85 x 6.90 9.5mm: 100.00 x 69.85 x 9.3	7mm:100.00 x 69.85 x 6.90 9.5mm: 100.00 x 69.85 x 9.3	7mm:100.00 x 69.85 x 6.90 9.5mm: 100.00 x 69.85 x 9.3	9.5mm: 100.00 x 69.85 x 9.3	7mm:100.00 x 69.85 x 6.90 9.5mm: 100.00 x 69.85 x 9.3	9.5mm: 100.00 x 69.85 x 9.3
MTBF (hours)	>1,000,000	>1,000,000	>1,200,000	>1,000,000	>1,000,000	>2,000,000

M.2 2280 & M.2 2242

Model	SV250-M280	SU210-M280	SS210-M280	SV250-M242	SS220-M242
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	MLC	3D TLC	SLC
Connector	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 2280	M.2 2242	M.2 2242
Capacity	30GB~960GB	32GB ~ 256GB	16GB~128GB	30GB~480GB	1GB~64GB
External DRAM	No	Yes	Yes	No	Yes
EST. Seq R/W Performance (MB/sec)	560/525	555/465	555/445	560/520	520/455
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
ECC Engine	Low-Density Parity-Check (LDPC) Code	Built-in up to 72-bit per 1K bytes BCH ECC	Built-in up to 40-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)	75K	78K	75K	75K	80K
Thermal Sensor	Yes	Yes	Yes	Yes	Yes
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%
Power Consumption	Active mode:455 mA / Idle mode: 80 mA	Active mode: 780mA & Idle mode: 155 mA	Active mode: 705 mA & Idle mode: 155 mA	Active mode: 405 mA / Idle mode: 70 mA	Active mode: 570mA & Idle mode: 85 mA
Dimension (mm)	Single side: 80.00 x 22.00 x 2.38 Double side: 80.00 x 22.00 x 3.88	Single side: 80.00 x 22.00 x 2.23 Double side: 80.00 x 22.00 x 3.58	Single side: 80.00 x 22.00 x 2.23 Double side: 80.00 x 22.00 x 3.58	42.00 x 22.00 x 3.80	42 x 22 x 3.6
MTBF (hours)	>1,000,000	>1,000,000	>1,000,000	>1,000,000	>2,000,000

mSATA/ mSATA mini




Model	SV250-300	SV250-300B	SU210-300	SS210-300
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	3D TLC	MLC	SLC
Connector	52 pin male	52 pin male	52 pin male	52 pin male
Form Factor	MO300	MO300B	JEDEC MO-300	JEDEC MO-300
Capacity	30~480GB	30~240GB	8GB~256GB	2GB~128GB
External DRAM	NO	NO	Yes	Yes
EST. Seq R/W Performance (MB/sec)	560/515	560/510	555/465	525/445
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
ECC Engine	Low-Density Parity-Check (LDPC) Code	Low-Density Parity-Check (LDPC) Code	Built-in 40-bit per 1K bytes BCH ECC	Built-in 40-bit per 1K bytes BCH ECC
IOPS (4K Random Write)	75K	74K	-	76K
Thermal Sensor	Yes	Yes	Yes	Yes
Shock	Operation: 50G, 11ms Non-operation: 1500G, 0.5ms			
Vibration	Operation: 7.69 Grms, 20~2000 Hz/random (compliant with MIL-STD-810G) Non-operation: 15G, 10 ~ 2000 Hz/sine		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%
Power Consumption	Active mode: 425 mA & Idle mode: 115 mA	Active mode: 430 mA & Idle mode: 125 mA	Active mode: 760 mA / Idle mode: 180 mA	Active mode: 685 mA / Idle mode: 180 mA
Dimension (mm)	50.80 x 29.85 x 4.85	29.85 x 26.80 x 3.85	Without housing: 50.8 x 29.85 x 3.8	Without housing: 50.8 x 29.85 x 3.8
MTBF (hours)	>1,000,000	>1,000,000	>1,000,000	>2,000,000

CF/ CFast Cards

Model	Industrial CF6A-SL	Industrial CF6A-M	Industrial CF6A	SM230-CFast	SS220-CFast
Interface	PC Card Memory Mode; PC Card I/O Mode; True IDE Mode	PC Card Memory Mode; PC Card I/O Mode; True IDE Mode	PC Card Memory Mode; PC Card I/O Mode; True IDE Mode	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)
Connector	50-pin	50-pin	50-pin	7 + 17 pin female connector	(7+17) pin male
Form Factor	CompactFlash Type I	CompactFlash Type I	CompactFlash Type I	CFast	CFast
NAND Flash Type	MLC	MLC	SLC	MLC	SLC
Capacity	4GB~32GB	8GB~64GB	256MB~32GB	8GB~256GB	4GB~64GB
External DRAM	-	-	-	No	Yes
EST. Seq R/W Performance (MB/sec)	115/80	115/75	60/65	560/470	555/445
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
ECC Engine	Built-in 72-bit per 1K bytes BCH ECC	Built-in 72-bit per 1K bytes BCH ECC	Built-in 72-bit per 1K bytes BCH ECC	Built-in up to 72-bit per 1K bytes BCH ECC	Built-in 40-bit per 1K bytes BCH ECC
IOPS (4K Random Write)	157	231	188	40K	80K
H/W Write Protect	Yes	Yes	Yes	YES	Yes
Thermal Sensor	-	-	-	YES	-
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)				
Power Consumption	Operating Voltage:3.3V – Active mode: 235mA – Standby mode: 10mA Operating Voltage:5.0V – Active mode: 245mA – Standby mode: 10mA	Operating Voltage:3.3V – Active mode: 255mA – Standby mode: 10mA Operating Voltage:5.0V – Active mode: 260mA – Standby mode: 10mA	Operating Voltage:3.3V – Active mode: 165mA – Standby mode: 10mA Operating Voltage:5.0V – Active mode: 230mA – Standby mode: 10mA	Active mode: 645 mA / Idle mode: 135 mA	Active mode: 570 mA & Idle mode: 75 mA
Dimension (mm)	36.4 x 42.8 x 3.3	36.4 x 42.8 x 3.3	36.4 x 42.8 x 3.3	42.80 x 36.45x 3.60	42.8 x 36.4 x 3.6
MTBF (hours)	>1,000,000	>1,000,000	>2,000,000	>1,000,000	>2,000,000

UDM/ USB drive/ microSD





Model	UDM2A-M (Type C)	UDM2A (Type D)	EH353-M	EH353	CV110-MSD	Industrial microSD R1
Interface	USB 2.0	USB 2.0	USB 3.0	USB 3.0	SD4.0	SD3.0
Connector	10 pin USB(2x5) female header in 2.54mm	10 pin USB(2x5) female header in 2.54mm	USB 3.0 A Type Plug	USB 3.0 A Type Plug	-	-
Form Factor	USB disk module	USB disk module	USB flash drive	USB flash drive	microSD	microSD
NAND Flash Type	MLC	SLC	MLC	SLC	3D TLC	SLC
Capacity	8G~128G	256MB~32G	8GB~128GB	256MB~32GB	SDHC:32GB~256GB	SD:GB~2GB; SDHC::4~8GB
EST. Seq R/W Performance (MB/sec)	44/43	44/41	205/95	80/70	90/34	34/28
ECC Engine	Built-in 72-bit per 1K bytes BCH ECC	Built-in 72-bit per 1K bytes BCH ECC	Built-in 39-bit per 1K bytes BCH ECC	Built-in 39-bit per 1K bytes BCH ECC	Built-in advanced ECC algorithm	Built-in 43-bit per 1K bytes BCH ECC
IOPS (4K Random Write)	190	105	-	-	1300	-
Standard Operating Temperature (°C)	0 ~ + 70	0 ~ + 70	0 ~ + 70	0 ~ + 70	-25 ~ + 85	-
Wide Temperature (°C)	-40 ~ + 85	-40 ~ + 85	-40 ~ + 85	-40 ~ + 85	-40 ~ + 85	-40 ~ + 85
Storage Temperature (°C)	-40 ~ + 100	-40 ~ + 100	-40 ~ + 100	-40 ~ + 100	-40 ~ + 85	-40 ~ + 100
H/W Write Protect	No	No	-	-	-	-
Screw Hole	Yes	Yes	-	-	-	-
Shock	Operation: Acceleration, 50(G)/11(ms)/half sine (compliant with MIL-STD-202G) Non-operation: Acceleration,1,500(G)/0.5(ms)/half sine (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)/random (compliant with MIL-STD-810G)					
Operating Voltage	5V ± 5%	5V ± 5%	5.0 V ± 5%	5.0 V ± 5%	2.7V ~ 3.6V	3.3 V ± 5%
Power Consumption	Active mode: 125 mA & Idle mode:50 mA	Active mode: 110 mA & Idle mode:45 mA	Active mode: 275 mA & Idle mode: 80 mA	Active mode: 225 mA & Idle mode: 65 mA	Active mode: 105 mA & Idle mode: 185 uA	Active mode: 115 mA & Idle mode: 265 uA
Dimension (mm)	37.8 x 26.65 x 10.76	36.8 x 26.65 x 5	59 x 18.4 x 9.1	59 x 18.4 x 9.1	15x11x1	15x11x1
MTBF (hours)	>1,000,000	>2,000,000	>1,000,000	>2,000,000	>3,000,000	>3,000,000

Wide Temp. ECC SODIMM

Model	DDR4 Wide Temp. ECC SODIMM	DDR3 Wide Temp. ECC SODIMM
Module Type	Wide Temperature ECC SODIMM	Wide Temperature ECC SODIMM
Memory Technology	DDR4	DDR3
Frequency	2133/2400/2666	1066/1333/1600
Density	4G/8G/16G	2G/4G/8G
Voltage	1.2v	1.5v/1.35v
Pin Count	260-Pin	204-Pin
Width	72-Bit	72-Bit
PCB Height	1.18"	1.18"
Operation Temperature	TC=-40℃ to 85℃	TC=-40℃ to 85℃
Value-added	Wide Temperature, Thermal Sensor, 30µ Gold Finger, Underfill, Conformal Coating	Wide Temperature, Thermal Sensor, 30µ Gold Finger, Underfill, Conformal Coating

Wide Temp. SODIMM

Model	DDR4 Wide Temp. SODIMM	DDR3 Wide Temp. SODIMM	DDR2 Wide Temp. SODIMM	DDR Wide Temp. SODIMM
Module Type	Wide Temperature SODIMM	Wide Temperature SODIMM	Wide Temperature SODIMM	Wide Temperature SODIMM
Memory Technology	DDR4	DDR3	DDR2	DDR
Frequency	2133/2400/2666	1066/1333/1600	533/667/800	266/333/400
Density	4G/8G/16G	1G/2G/4G/8G	512M/1G/2G	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	64-Bit	64-Bit	64-Bit	64-Bit
PCB Height	1.18"	1.18"	1.18"	1.25"
Operation Temperature	TC=-40℃ to 85℃	TC=-40℃ to 85℃	TC=-40℃ to 85℃	TA=-40℃ to 85℃
Value-added	Wide Temperature, 30µ Gold Finger, Underfill, Conformal Coating	Wide Temperature, 30µ Gold Finger, Underfill, Conformal Coating	Wide Temperature, 30µ Gold Finger, Underfill, Conformal Coating	Wide Temperature, 30µ Gold Finger, Underfill, Conformal Coating

VLP SODIMM & VLP ECC SODIMM

Model	DDR4 VLP SODIMM	DDR4 VLP ECC SODIMM
Module Type	VLP SODIMM	VLP ECC SODIMM
Memory Technology	DDR4	DDR4
Frequency	2133/2400/2666	2133/2400/2666
Density	4G/8G	4G/8G
Voltage	1.2v	1.2v
Pin Count	260-Pin	260-Pin
Width	64-Bit	72-Bit
PCB Height	0.71"	0.7"
Operation Temperature	TC=-0℃ to 85℃	TC=-0℃ to 85℃
Value-added		

Anti-sulfuration SODIMM

Model	DDR4 Anti-sulfuration SODIMM	DDR3 Anti-sulfuration SODIMM
Module Type	Anti-sulfuration SODIMM	Anti-sulfuration SODIMM
Memory Technology	DDR4	DDR3
Frequency	2133/2400/2666	1066/1333/1600
Density	4G/8G/16G	1G/2G/4G/8G
Voltage	1.2v	1.35v/1.5v
Pin Count	260-Pin	204-Pin
Width	64-Bit	64-Bit
PCB Height	1.18"	1.18"
Operation Temperature	TC=0℃ to 85℃ / -40℃ to 85℃	TC=0℃ to 85℃ / -40℃ to 85℃
Value-added		

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