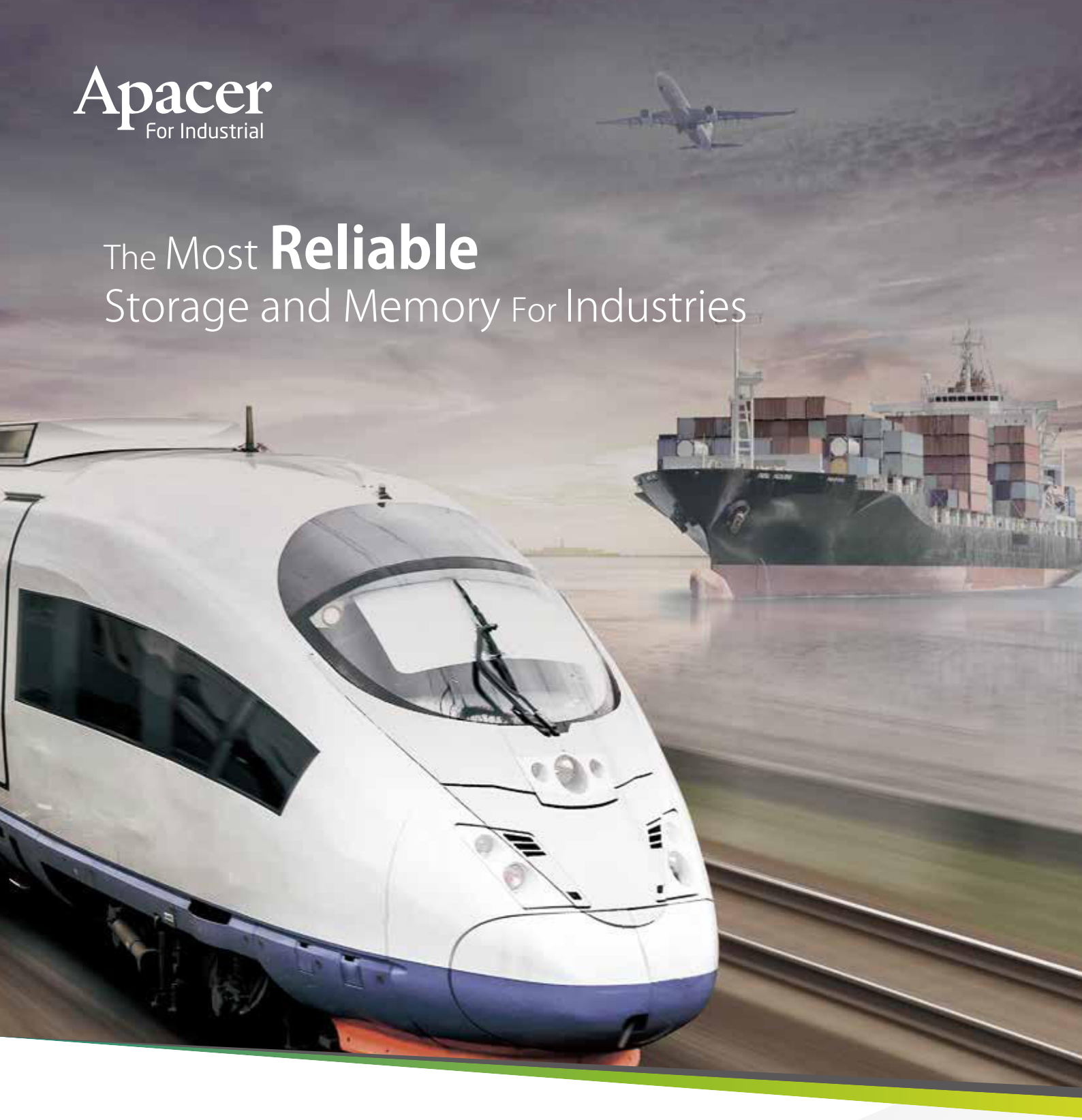
Apacer
For Industrial

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



Transportation 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

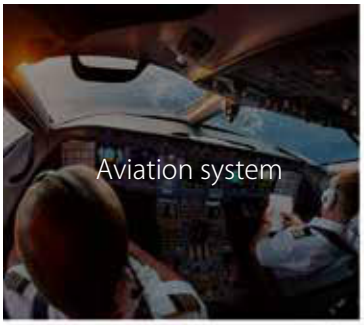
Trustworthy Supplier

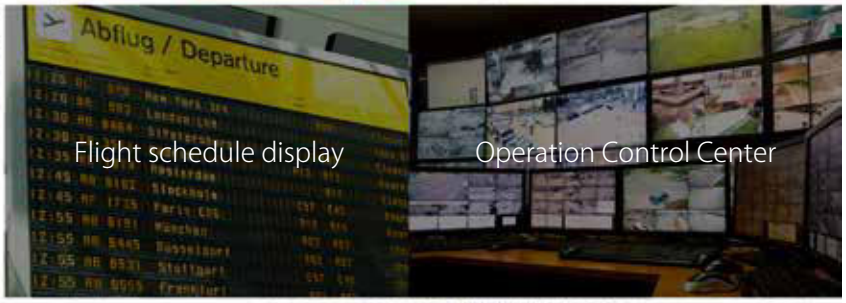
- A global-scale service and maintenance system
- Responsive local FAE technical support
- 24/7 flexible and quick delivery service
- Complete RMA system

Challenges and Requirements for Transportation Applications

In recent years, SSDs have found homes in a wide variety of transportation-related products. From entertainment and navigation systems in vehicles to surveillance and traffic control systems outdoors, SSDs are tasked with reliably reading and writing data. Apacer's industrial SSD solutions are the result of years of experience making and customizing these devices. And with self-driving vehicles just over the horizon, applications for Apacer's reliable storage solutions are sure to grow.

Storage and Memory Solutions in the Transportation Industry





Challenges and Requirements

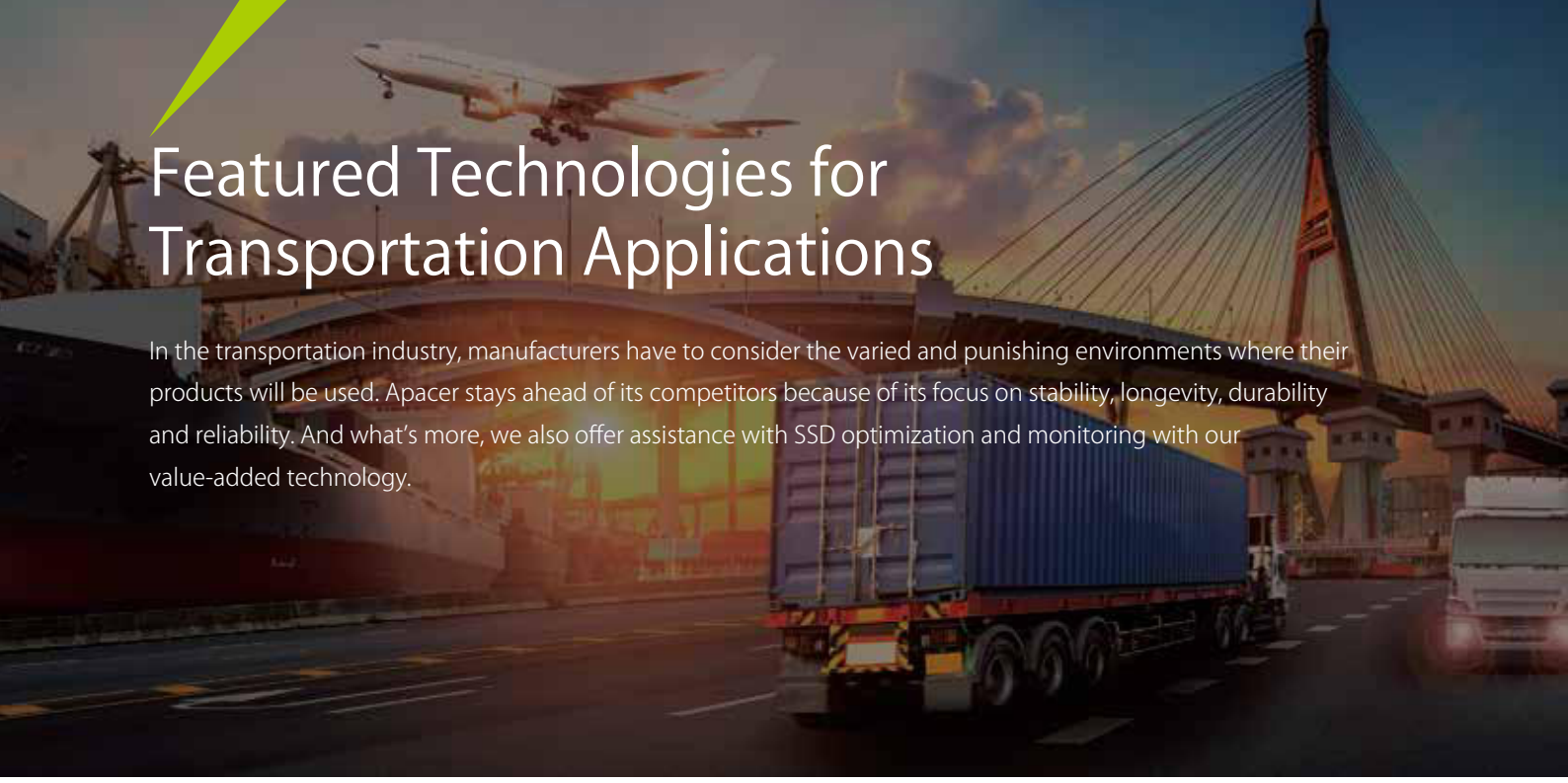
Tough Enough To Survive Anywhere In The World

More than perhaps any other industry, the transportation industry has to develop vehicles and systems that will be used in a variety of harsh environments. From bitterly cold conditions to burning desert landscapes, transportation technology has to resist the extremes of temperature, humidity, dust and vibration. And natural weather systems aren't the end of it. Many parts of the world where vehicles need to travel are badly polluted.

Luckily, Apacer's engineers are seasoned professionals at creating storage solutions that can resist even the most challenging conditions.

Voltage Instability Is No Longer A Problem

Especially in developing countries or remote areas, voltage supply can sometimes be compromised. That's why Apacer has created storage solutions that can mitigate and offset the effects of voltage instability. Thanks to our innovative protection systems, storage solutions will still maintain data integrity if voltage instability issues occur.



Featured Technologies for Transportation Applications

In the transportation industry, manufacturers have to consider the varied and punishing environments where their products will be used. Apacer stays ahead of its competitors because of its focus on stability, longevity, durability and reliability. And what's more, we also offer assistance with SSD optimization and monitoring with our value-added technology.

Power Stability

- CorePower
- DataDefender™

Longevity

- Over-Provisioning
- SLC-lite
- SLC-liteX
- Fixed BOM
- 6+6 PCN/EOL Policy

Survivability

- Anti-Sulfuration
- Nano Coating (IP57)
- Underfill
- 30µ Gold Finger
- Conformal Coating
- Sidefill
- Wide Temperature

Value-Added Application

- Double-barreled Solution
  - CoreAnalyzer2
  - SSDWidget 2.0

Power Stability

CorePower

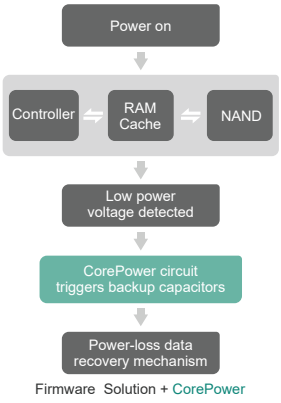
Apacer's hardware-based technology is designed to prevent data loss and ensure the stability of data transmission during a power outage by implementing backup power supply that allows sufficient time to move all cached data to NAND flash.

- 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

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.



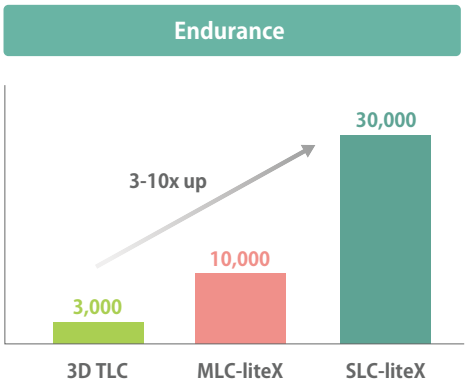
Longevity

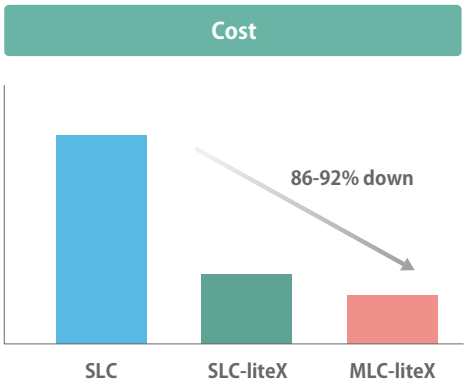
Over-Provisioning

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-liteX

Apacer's 3D NAND SLC-liteX technology breaks through the limitations of existing technology and provides up to 30,000 P/E cycles, which is 10 times more than MLC or industrial 3D TLC.





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.

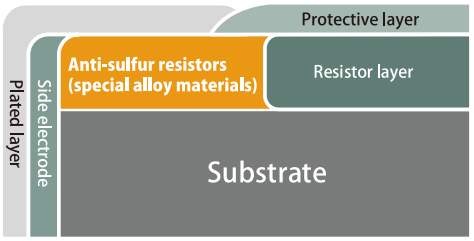
Survivability

Anti-Sulfuration

Apacer's world's first patented anti-sulfuration DRAM modules and anti-sulfuration SSDs with the industry's highest level of anti-corrosion ANSI/ISA 71.04 G3 Certification can meet the needs of industrial products facing harsh environments.

Apacer's anti-sulfuration technology

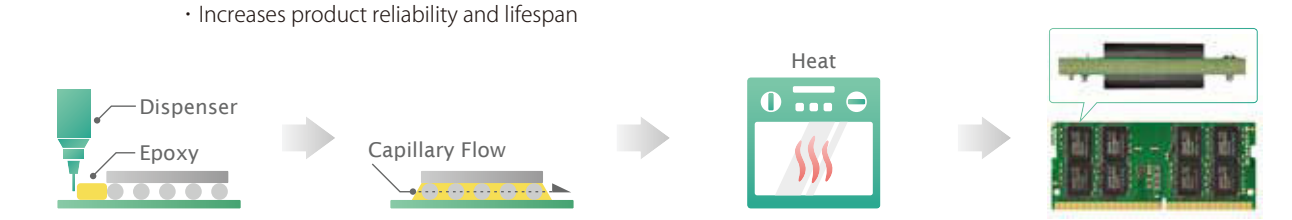
Resistor construction



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



a.Underfill Dispensing | b.Dispense Completed | c.Underfill Cure | d.Finished Product

Sidefill

Apacer's Sidefill technology strengthens the connections between solder joints and their board, making them more robust and vibration-resistant. It also allows for heat dissipation to offset thermal damage.

30µ Gold Finger

With 30µ gold plating, the connector interface is more reliable and can withstand potential damage that can arise in industrial applications.

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.

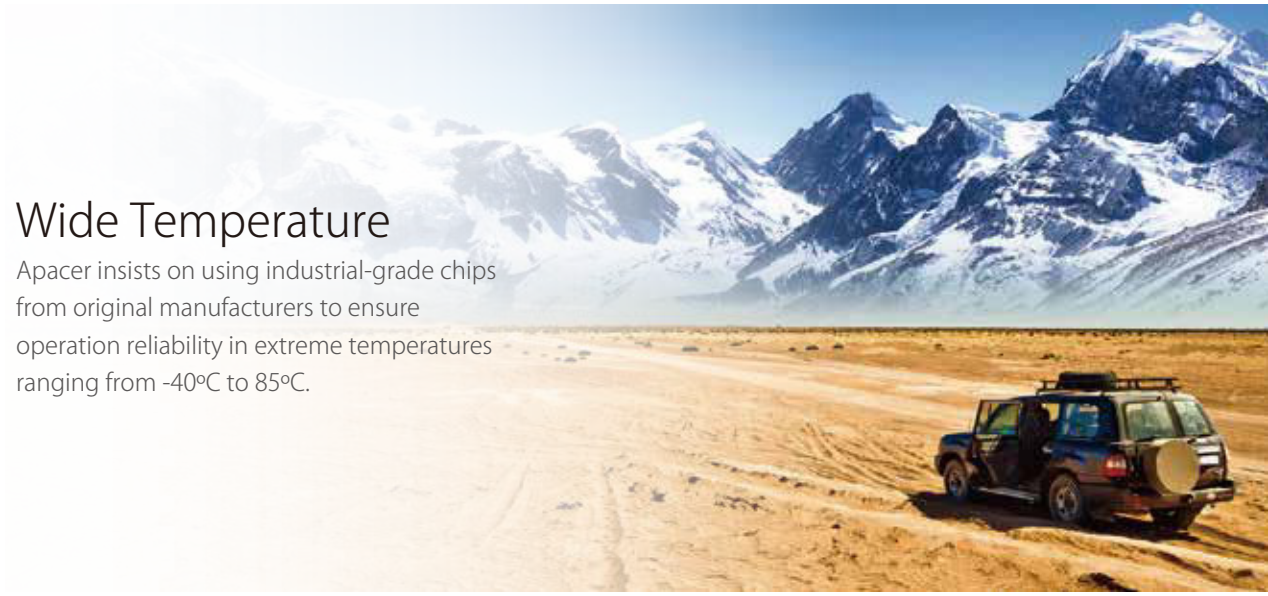
- **Uses automated spraying to maintain precise coating thickness**
- **Enhances product reliability**
- **Prolongs SSD and DRAM modules lifespan**

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
Cost	$	$$$
Additional LT	14 Working-days	14 Working-days



Wide Temperature

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

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

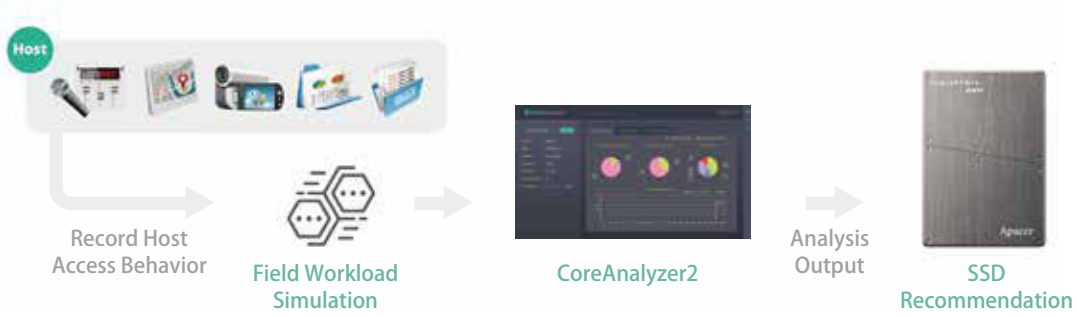
SSDWidget 2.0 – Monitor your SSD Status

Anticipate and mitigate SSD failures remotely

Longer-lasting SSDs

CoreAnalyzer2

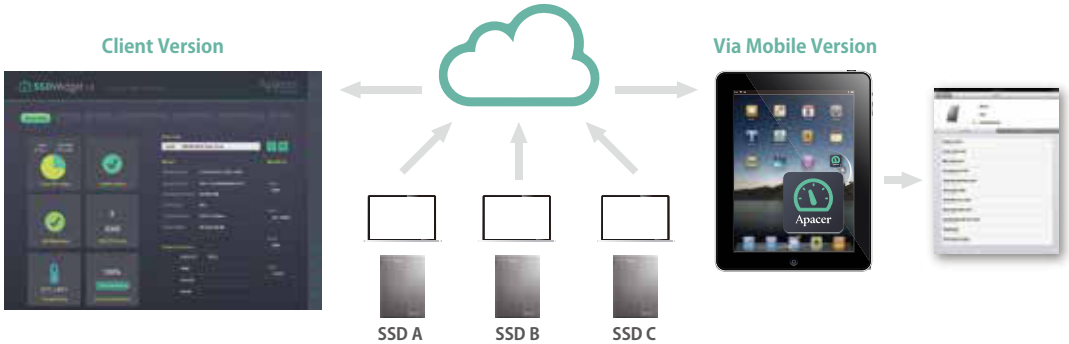
CoreAnalyzer is an exclusive, analytic data-behavior technology integrated with Apacer's SSD products. By collecting and analyzing data from a customer's host system, it can help customers analyze their usage behavior so they can choose the best-suited SSD for their application.



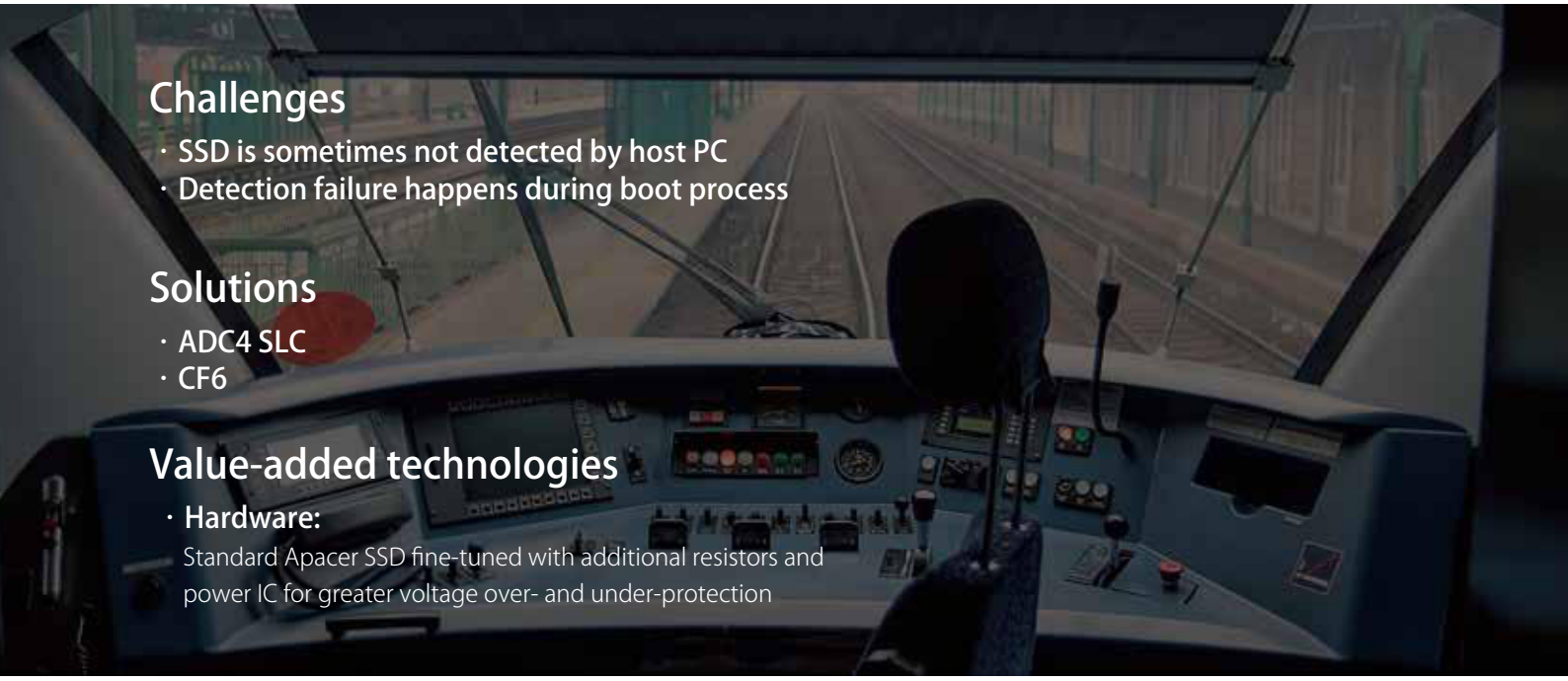
SSDWidget 2.0

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

- SSD is sometimes not detected by host PC
- Detection failure happens during boot process

Solutions

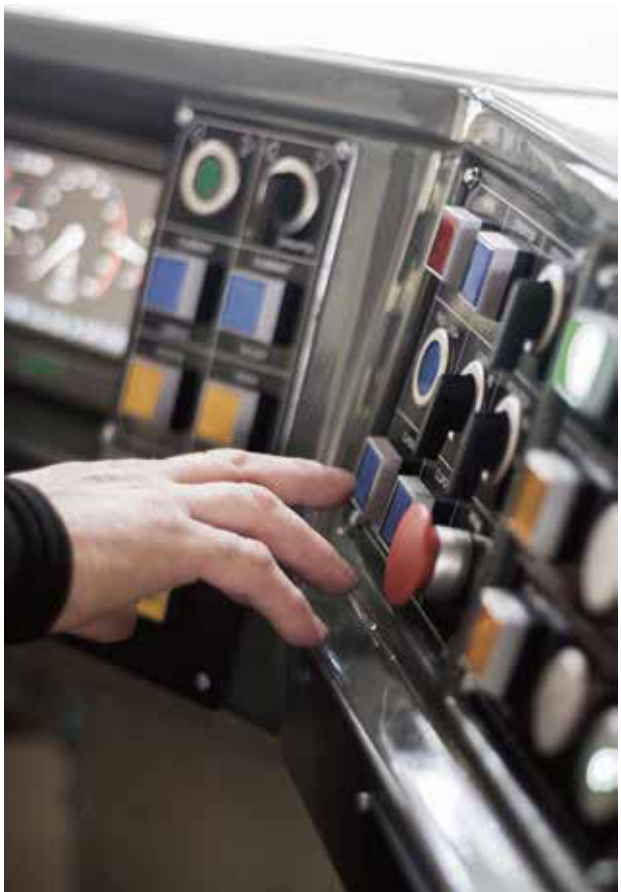
- ADC4 SLC
- CF6

Value-added technologies

- **Hardware:**
  Standard Apacer SSD fine-tuned with additional resistors and power IC for greater voltage over- and under-protection

The Customer and the Application: High-speed Rail Transportation Systems

Our customer is an experienced transportation system integrator in the high-speed rail industry. The customer is currently in the process of implementing high-speed rail solutions that cover large parts of China.



Challenges

The customer told us about a certain problem they had discovered. Whenever a train booted up its transportation system, there was a chance that the host PC would have trouble detecting the SSD. This didn't happen all of the time, but it happened enough times that the client realized there was the potential for a serious problem.

However, the client knew that Apacer could help them investigate the issue and perhaps come up with a solution. They were right, and after an exhaustive discussion of the issues online and via telephone, an Apacer engineer was en route to the demonstration train that was already undergoing early tests. He gathered data on location, and then reported back to the Apacer headquarters so that our team could begin the analysis process.

Solutions and Technologies

Analysis of the data that the engineer brought back revealed the source of the issue. We discovered that the voltage supplied to the SSD could become unstable when the transportation system booted up. After initializing, the SSD should be supplied a minimum operating voltage within a certain fixed period of time. But in certain cases, the actual supplied voltage took longer to meet the threshold, so the SSD did not power up. In other cases, the supplied voltage might meet the threshold in time, but then dip below it for a few moments.

After some discussion, our hardware team modified the resistor structure in our standard SSD. These allowed the SSD to filter out unsuitable operating voltages, and in most cases these resistors would be enough. But in this case, we also added a redundant power IC to monitor and report on voltage instability. Together, these two powerful protection mechanisms extend the practical operating lifespan of the SSD, no matter how unpredictable the voltage supply might be.

Results and Benefits

After these modifications, our customer was pleased to discover that the SSD functioned much more smoothly. Now, as they continue to expand their operations in China, they keep coming back to us for customized SSDs for their transportation systems. And we've incorporated what we've learned from this case into other systems that can function smoothly even when voltage supplies are unstable.

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 transportation applications

Rugged and robust design

Compliant with MIL-STD-810G
(shock and vibration),
Test Method 503.5 (temperature shock)
Test Method 500.6 Low Pressure (altitude)
and FIPS 140-2 certified (security)

Longevity

Fixed BOM support
6+6 PCN/EOL Policy
Unique S/N for RMA tracking

Strong R&D and customization capabilities

Apacer's Premium Package: VehiclePro™

A Tailor-Made Technology Set for Transportation Applications

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

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

2.5" SSD




Model	SV170-25	SV250-25	SM130-25	SM210-25 SM21P-25*
Interface	SATA3.0 (6Gb/s)	SATA3.0 (6Gb/s)	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)
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"
NAND Flash Type	3D TLC	3D TLC	MLC	MLC
Capacity	60GB ~960GB	30GB~480GB	512GB~2TB	32GB~512GB
External DRAM	No	No	Yes	Yes
Sustained Read Performance (MB/sec)	Up to 560	Up to 560	Up to 530	Up to 510
Sustained Write Performance (MB/sec)	Up to 510	Up to 520	Up to 510	Up to 380
ECC Engine	Low-Density Parity-Check (LDPC) Code	Low-Density Parity-Check (LDPC) Code	Built-in up to 120-bit per 2K bytes BCH ECC	Built-in 40-bit per 1K bytes BCH ECC
IOPs (4K Random Write)	85K	74K	89K	79K
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	Optional	Optional
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 ± 10%	5.0 V ± 10%	5.0 V ± 5%	5.0 V ± 5%
Power Consumption	Active mode: 525 mA Idle mode: 90 mA	Active mode: 385 mA Idle mode: 100 mA	Active mode: 1,040 mA & Idle mode: 80 mA	Active mode: 680 mA & Idle mode: 60 mA
Dimension (mm)	100.00 x 69.85 x 6.90	100.00 x 69.85 x 6.90	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 69.84 x 9.30
MTBF (hours)	>1,000,000	>1,000,000	>1,000,000	>1,000,000

*Includes CorePower technology.

M.2 2280 / mSATA (MO-300) / SSD Module

Model	SV170-M280	SV250-280	SM210-M280 SM21P-M280*	SV170-300	SV250-300	SM230-300 SM23P-300*	SDM5A
Interface	SATA3.0 (6Gb/s)	SATA3.0 (6Gb/s)	SATA 3.0 (6Gb/s)	SATA3.0 (6Gb/s)	SATA3.0 (6Gb/s)	SATA 3.0 (6Gb/s)	SATA 3.0 (6Gb/s)
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	52-pin	7-pin
Form Factor	M.2 2280	M.2 2280	M.2 2280	MO-300	MO-300	MO-300	SATA Disk Module
NAND Flash Type	3D TLC	3D TLC	MLC	3D TLC	3D TLC	MLC	SLC
Capacity	30GB~960GB	30GB~960GB	32GB~256GB	30GB - 960GB	30GB - 480GB	32GB~512GB	8GB~32GB
External DRAM	No	No	Yes	No	No	No	No
Sustained Read Performance (MB/sec)	Up to 560	Up to 560	Up to 510	Up to 560	Up to 560	Up to 560	Up to 435
Sustained Write Performance (MB/sec)	Up to 515	Up to 525	Up to 475	Up to 510	Up to 520	Up to 510	Up to 215
ECC Engine	Low-Density Parity-Check (LDPC) Code	Low-Density Parity-Check (LDPC) Code	Built-in up to 40-bit per 1K bytes BCH ECC	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)	87K	75K	45K	87K	74K	58K	47K
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	Optional	Yes	Yes	Optional	Optional
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%	5.0 V ± 5%	5.0 V ± 5%
Power Consumption	Active mode: 540 mA Idle mode: 95 mA	Active mode: 455 mA Idle mode: 80 mA	Active mode: 745 mA Idle mode: 75 mA	Active mode: 540 mA Idle mode: 90 mA	Active mode: 400 mA Idle mode: 60 mA	Active mode: 925 mA Idle mode: 125 mA	Active mode: 260 mA Idle mode: 60 mA
Dimension (mm)	80.00 x 22.00 x 3.58	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	50.80 x 29.85 x 4.85	50.80 x 29.85 x 4.85	50.80 x 29.85 x 3.80	33.0 x 29.3 x 8.85
MTBF (hours)	>1,000,000	>1,000,000	>1,000,000	>1,000,000	>1,000,000	>1,000,000	>2,000,000

*Includes CorePower technology.

microSD / SD / CF

Model	Industrial microSD R1	Industrial SD R1	CS710-CF	Industrial CF6A
Interface	SD 3.0	SD 3.0	PC Card Memory Mode; PC Card I/O Mode; True IDE Mode	PC Card Memory Mode; PC Card I/O Mode; True IDE Mode
Form Factor	microSD	SD	CompactFlash Type I	CompactFlash Type I
NAND Flash Type	SLC	SLC	SLC	SLC
Capacity	SD: 1GB~2GB SDHC: 4~8GB	SD: 1GB~2GB; SDHC: 4~16GB	128MB~64GB	256MB~32GB
Sustained Read Performance (MB/sec)	Up to 34	Up to 43	Up to 55	Up to 60
Sustained Write Performance (MB/sec)	Up to 28	Up to 41	Up to 55	Up to 65
ECC Engine	Built-in 43-bit per 1K bytes BCH ECC	Built-in 43-bit per 1K bytes BCH ECC	Built-in BCH ECC capable of correcting up to 96 bits in 1KB data	Built-in 72-bit per 1K bytes BCH ECC
Wide Temperature (°C)	-40 ~ + 85	-40 ~ + 85	-40 ~ + 85	-40 ~ + 85
Storage Temperature (°C)	-40 ~ + 100	-40 ~ + 100	-40 ~ + 100	-40 ~ + 85
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 / 5.0 V ± 5%	3.3 V / 5.0 V ± 5%
Power Consumption	Active mode: 50 mA & Idle mode: 265mA	Active mode: 120 mA & Idle mode: 260 mA	Operating Voltage: 3.3V Active mode: 145 mA Standby mode: 10 mA Operating Voltage: 5.0V Active mode: 145 mA Standby mode: 10 mA	Operating Voltage: 3.3V Active mode: 165 mA Standby mode: 10 mA Operating Voltage: 5.0V Active mode: 230 mA Standby mode: 10 mA
Dimension (mm)	15 x 11 x 1.0	32 x 24 x 2.1	36.4 x 42.8 x 3.3	36.4 x 42.8 x 3.3
MTBF (hours)	>3,000,000	>3,000,000	>2,000,000	>2,000,000

PATA SSD

Model	ADC4	ADM5S	AFD257-M
Interface	Standard ATA/IDE	Standard ATA/IDE	Standard ATA/IDE
Connector	32-pin	44-pin	44-pin
Operation Mode	PIO Mode up to 4/ Multiword DMA Mode up to 2/ Ultra DMA Mode up to 6	PIO Mode up to 4/ Multiword DMA Mode up to 2/ Ultra DMA Mode up to 6	PIO Mode up to 4/ Multiword DMA Mode up to 2/ Ultra DMA Mode up to 6
Form Factor	PATA Disk Chip	PATA DOM	2.5"
NAND Flash Type	SLC	SLC	MLC
Capacity	128MB~16GB	128MB~64GB	32GB~256GB
External DRAM	No	No	No
Sustained Read Performance (MB/sec)	Up to 41	Up to 75	Up to 100
Sustained Write Performance (MB/sec)	Up to 35	Up to 65	Up to 90
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
Standard Operating Temperature (°C)	0 ~ + 70	0 ~ + 70	0 ~ + 70
Wide Temperature (°C)	-40 ~ + 85	-40 ~ + 85	-40 ~ + 85
Storage Temperature (°C)	-40 ~ + 100	-40 ~ + 100	-40 ~ + 100
Housing	Yes	No	Yes
H/W Write Protect	No	No	No
Screw Hole	No	Yes	No
Shock	Half sine wave, Peak acceleration 50 G, 11 ms	1500G (complied with MIL-STD810)	1500G (complied with MIL-STD810)
Vibration	Sine wave : 10~2000Hz, 15G	15G (complied with MIL-STD810)	15G (complied with MIL-STD810)
Operating Voltage	3.3 V ± 5% / 5 V ± 5%	3.3 V ± 5% / 5 V ± 5%	5 V ± 5%
Power Consumption	Active mode: 170 mA & Idle mode: 3 mA	Active mode: 265 mA & Idle mode: 5 mA	Active mode: 400 mA & Idle mode: 20 mA
Dimension (mm)	42.60 x 19.30 x 5.90	45.00 x 28.00 x 6.85	100.00 x 69.80 x 9.30
MTBF (hours)	>2,000,000	>2,000,000	>1,000,000

Anti-Sulfuration DRAM Modules




Model	DDR4 Anti-Sulfuration UDIMM	DDR3 Anti-Sulfuration UDIMM	DDR4 Anti-Sulfuration SODIMM	DDR3 Anti-Sulfuration SODIMM
Module Type	Anti-Sulfuration UDIMM	Anti-Sulfuration UDIMM	Anti-Sulfuration SODIMM	Anti-Sulfuration SODIMM
Memory Technology	DDR4	DDR3	DDR4	DDR3
Frequency	2133/2400/2666	1066/1333/1600	2133/2400/2666	1066/1333/1600
Density	4G/8G/16G	1G/2G/4G/8G	4G/8G/16G	1G/2G/4G/8G
Voltage	1.2v	1.35v/1.5v	1.2v	1.35v/1.5v
Pin Count	288-Pin	240-Pin	260-Pin	204-Pin
Width	64-Bit	64-Bit	64-Bit	64-Bit
PCB Height	1.23	1.18	1.18	1.18
Operation Temperature	TC=0℃ to 85℃	TC=0℃ to 85℃	TC=0℃ to 85℃ / -40℃ to 85℃	TC=0℃ to 85℃ / -40℃ to 85℃
Value-Added	30µ	30µ	30µ	30µ

Wide Temperature DRAM Modules




Model	DDR4 Wide Temp. SODIMM	DDR3 Wide Temp. SODIMM	DDR4 Wide Temp. UDIMM	DDR3 Wide Temp. UDIMM
Module Type	Wide Temperature SODIMM	Wide Temperature SODIMM	Wide Temperature UDIMM	Wide Temperature UDIMM
Memory Technology	DDR4	DDR3	DDR4	DDR3
Frequency	2133/2400/2666	1066/1333/1600	2133/2400/2666	1066/1333/1600
Density	4G/8G/16G	1G/2G/4G/8G	4GB/8GB/16GB	1G/2G/4G/8G
Voltage	1.2v	1.5v/1.35v	1.2v	1.5v/1.35v
Pin Count	260-Pin	204-Pin	288-Pin	240-Pin
Width	64-Bit	64-Bit	64-Bit	64-Bit
PCB Height	1.18	1.18	1.23	1.18
Operation Temperature	TC=-40℃ to 85℃	TC=-40℃ to 85℃	TC=-40℃ to 85℃	TC=-40℃ to 85℃
Value-Added	30µ	30µ	30µ	30µ

VLP DIMM DRAM Modules




Model	DDR4 VLP UDIMM	DDR3 VLP UDIMM	DDR4 VLP SODIMM	DDR4 VLP ECC SODIMM
Module Type	VLP UDIMM	VLP UDIMM	VLP SODIMM	VLP ECC SODIMM
Memory Technology	DDR4	DDR3	DDR4	DDR4
Frequency	2133/2400/2666	1066/1333/1600	2133/2400/2666	2133/2400/2666
Density	4G/8G/16G	1G/2G/4G/8G	4G/8G	4G/8G
Voltage	1.2v	1.5v/1.35v	1.2V	1.2V
Pin Count	288-Pin	240-Pin	260-Pin	260-Pin
Width	64-Bit	64-Bit	64-Bit	72-Bit
PCB Height	0.738	0.738	0.709	0.7
Operation Temperature	TC=0℃ to 85℃	TC=0℃ to 85℃	TC=0℃ to 85℃	TC=0℃ to 85℃
Value-Added	Underfill, Conformal Coating	Underfill, Conformal Coating	30μ, Underfill, Conformal Coating	30μ, Underfill, Conformal Coating

32-Bit SODIMM


Model	DDR4 32-Bit SODIMM	DDR3 32-Bit SODIMM
Module Type	32-Bit SODIMM	32-Bit SODIMM
Memory Technology	DDR4	DDR3
Frequency	2133/2400/2666	800/1066/1333
Density	2G/4G/8G	1G/2G/4G
Voltage	1.2v	1.5v
Pin Count	260-Pin	204-Pin
Width	32-Bit	32-Bit
PCB Height	1.18	1.18
Operation Temperature	TC=0℃ to 85℃	TC=0℃ to 85℃
Value-Added	Underfill, Conformal Coating	Underfill, Conformal Coating

XR-DIMM

- Innovative board-to-board connector design
- Adopts highly durable 300-pin connector and mounting holes to improve the anti-vibration and anti-shock reliability
- Supports multiple protection technologies and value-added applications

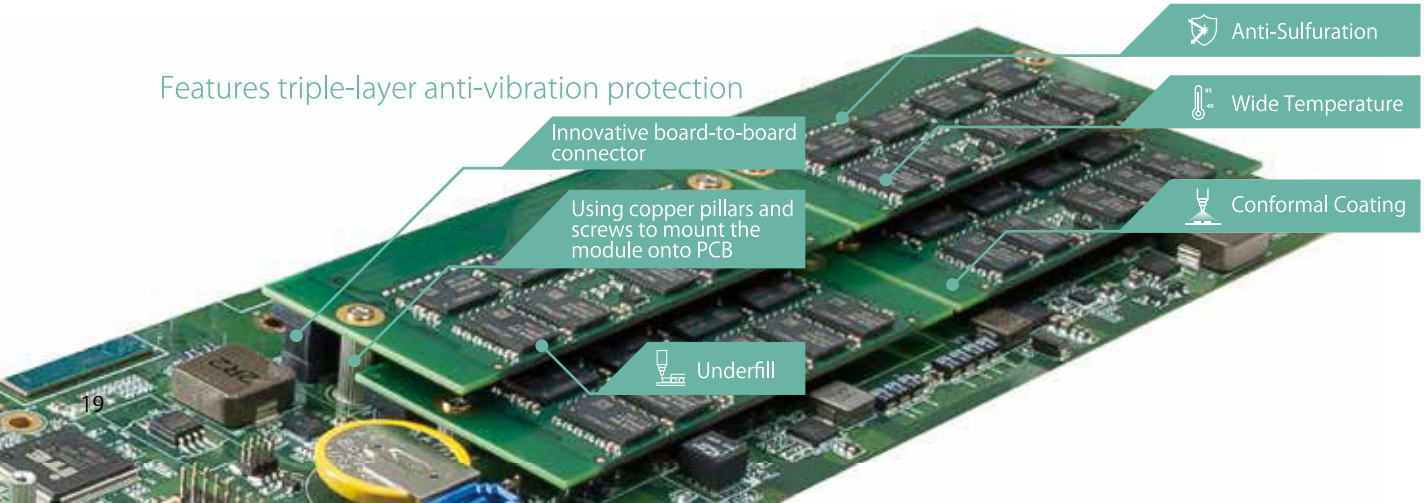
Model	DDR4 XR-DIMM
Module Type	XR-DIMM
Memory Technology	DDR4
Frequency	2133/2400
Density	8G/16G
Voltage	1.2v
Pin Count	300-Pin
Width	72-Bit
PCB Height	1.466
Operation Temperature	TC=-40℃ to 85℃
Value-Added	Wide Temperature, Thermal Sensor, Anti-Sulfuration, Underfill, Conformal Coating

Rugged Memory Comparison

	XR-DIMM Rugged Memory	Onboard memory
Anti-shock & anti-vibration ability	Great	Great
Memory upgradability	Yes	No
Repair difficulty	Easy	Difficult
RMA cost	Low	High
Stackable design	Yes	No
Motherboard space usage	Flexible	Uniformed and inflexible

Supports multiple value-added applications

Features triple-layer anti-vibration protection



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