

Apacer
For Industrial

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

Defense Solutions

industrial.apacer.com

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What Sets Apacer Apart?

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

Professional Technique

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

5 YEARS CONSISTENTLY RANKED

1

INDUSTRIAL SSD SUPPLIER
GARTNER

Trustworthy Supplier

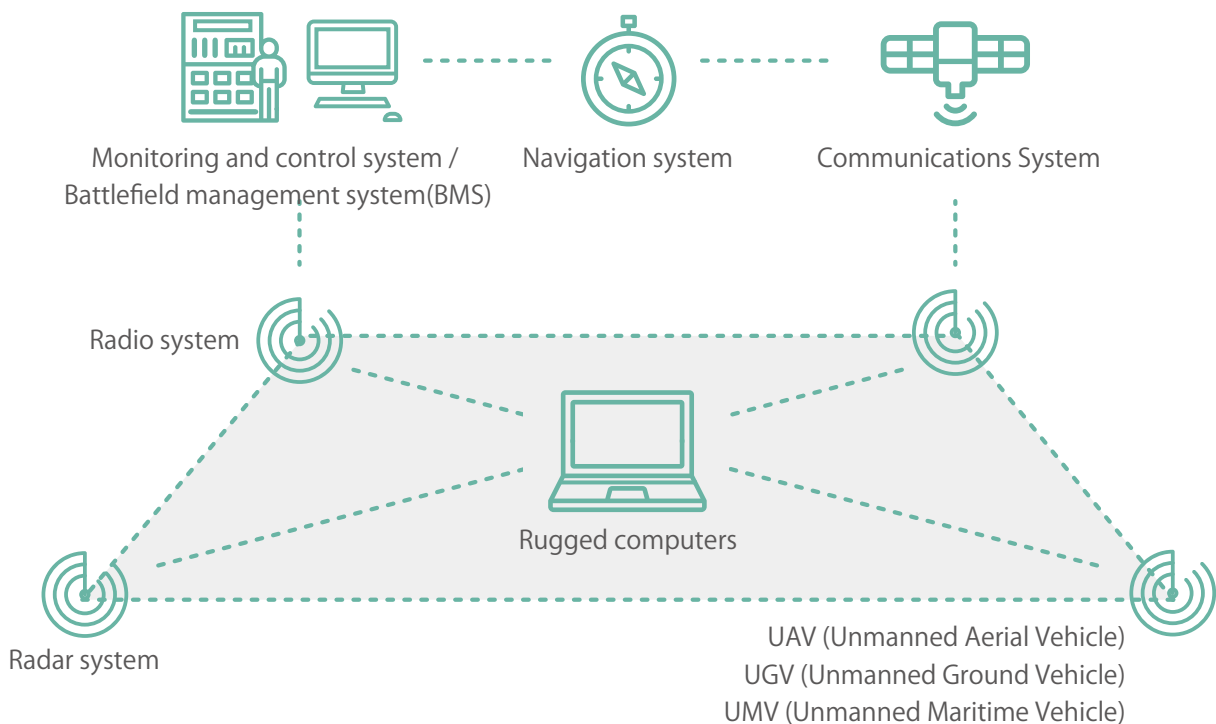
- A global-scale service and maintenance system
- Responsive local FAE technical support
- 24/7 flexible and quick delivery service
- Complete RMA system



Challenges and Requirements for Defense Applications

According to SIPRI (Stockholm International Peace Research Institute), world military expenditure is estimated to have reached \$1.7 trillion in 2017, the highest level since the end of the Cold War. After 13 consecutive years of increases from 1999 to 2011 and relatively unchanged spending from 2012 to 2016, the total world military expenditure rose marginally in 2017, by 1.1 % in real terms. Moreover, the military spending in 2017 represented 2.2 % of global GDP. As this industry continues to grow, so will the need for SSDs and DRAM that meet military standards. Apacer's defense-grade SSDs and DRAM solutions are already widely used in various aerospace and defense applications, including rugged PCs, battlefield management systems and UAVs.

Defense Applications





Challenges and Requirements

The highest standard of reliability, even in tough conditions

In a conflict, even a single data access exception or error could lead to very serious consequences. That's why we focus on performance and stability when creating industrial SSDs and DRAM. We also ensure that our products can function smoothly even in harsh environments thanks to extensive testing.

Cutting-edge protection safeguards sensitive data

As defense data can be highly sensitive, it is liable to cause irreparable damage to national security if it is lost or stolen. We employ the latest in protection technology to keep data secure within our industrial SSDs and DRAM.

Featured Technologies for Defense 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.

Security



- TCG Opal 2.0
- AES Encryption
- CoreEraser
- ATA Secure Erase
- Instant Keychange
- Write Protect
- CoreDestroyer

Reliability



- DataDefender™
- CorePower
- Thermal Throttling
- 30μ Gold Contact

Extreme Environments



- Wide Temperature
- Conformal Coating
- Nano Coating (IP57)
- Underfill
- Sidefill
- Anti-Sulfuration

Value-Added Application



- SSDWidget 2.0



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



Hardware-Based AES Encryption

AES 256-bit encryption is an extremely high encryption standard. To brute-force it would take literally millions of years, so it has been adopted by many governments and defense contractors over recent years.



CoreEraser

The CoreEraser comes in three types of block sanitizations and can be implemented through software command or hardware architecture.

- **Quick Erase:**

Eliminates FAT (File Allocation Table) and the MBR (Master Boot Record) in LBA.

- **Full Erase:**

Erases all contents of MBR and FAT as well as user and free blocks.

- **Mil Erase:**

Sanitizes the MBR and FAT as well as user and free blocks by erasing the blocks, overwriting with random data, then verifying. Mil Erase supports a variety of MIL erase standards:

- NSA 9-12
- USA-Army 380-19
- DoD 5220.22-M
- USA Navy NAVSO P-5239-26
- NSA Manual 130-2
- NISPOMSUP Chap 8, Sect. 8-501
- USA-AF AFSSI 5020
- IREC (IRIG) 106



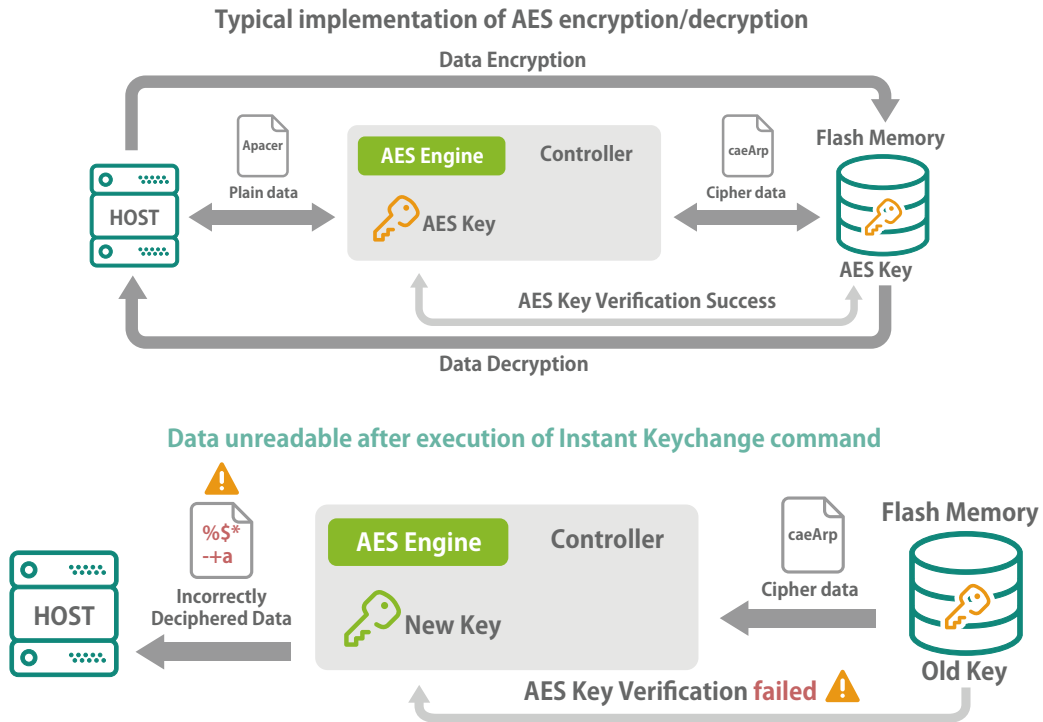
ATA Secure Erase

Securely and thoroughly erases data in operating blocks, which can be implemented through vendor software command or hardware architecture.



Instant Keychange™

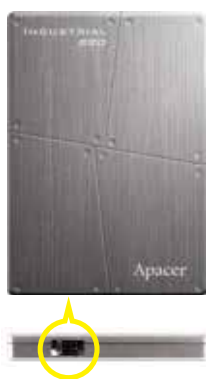
Apacer NAND flash storage bases the Instant Keychange™ function on AES encryption, and it can be triggered either via hardware or software. The encrypted data can never be accessed once the original key is destroyed. And destroying the original key and creating a new one takes less than a second – much faster than traditional forms of drive erasure.



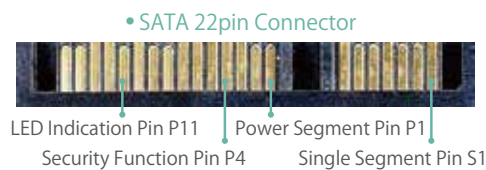
Write Protect

Write Protect can prevent drives from unauthorized data write via a hardware switch/pin or vendor software command.

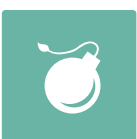
a. Pin Header



b. Pin Configuration



c. Slide Switch



CoreDestroyer

Advanced encryption mechanism for data security

CoreDestroyer is an advanced security and ultimate disk-wiping feature for users to destroy all data on the device without any possible retrieval method. The technology terminates all the data on the drive, even the firmware and the management table. The drive will be unable to perform any function.





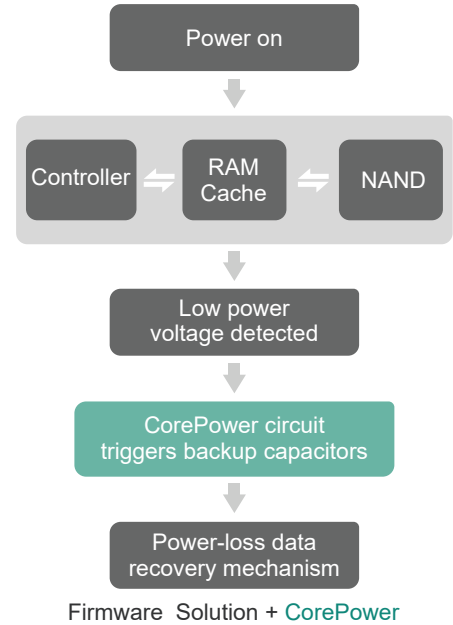
Reliability



Data Defender™

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.



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

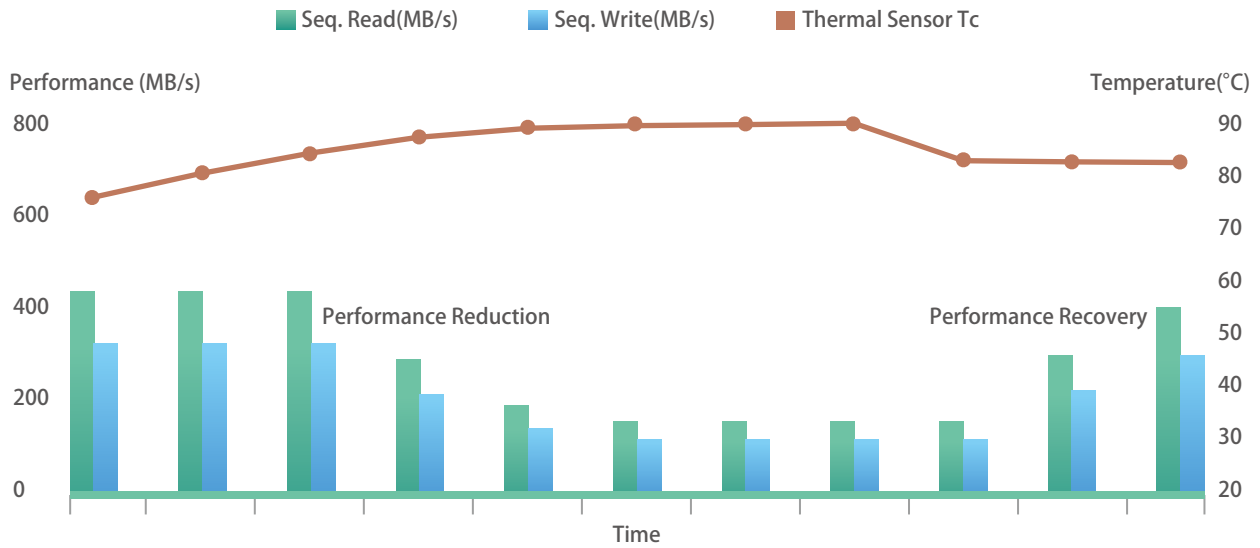




Thermal Throttling

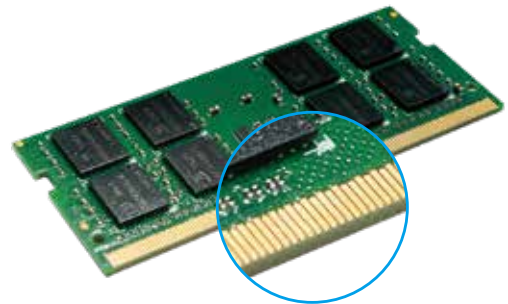
To prevent overheating, Apacer equips SSD products with a built-in thermal sensor to monitor the temperature of the SSD via S.M.A.R.T commands and configures the drive with firmware deployment of thermal throttling to manage the device temperature when responding to increased temperature conditions.

Read/Write Performance vs Temperature



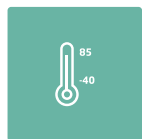
30μ Gold Contact

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



Extreme Environments

Temperature



Wide Temperature

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



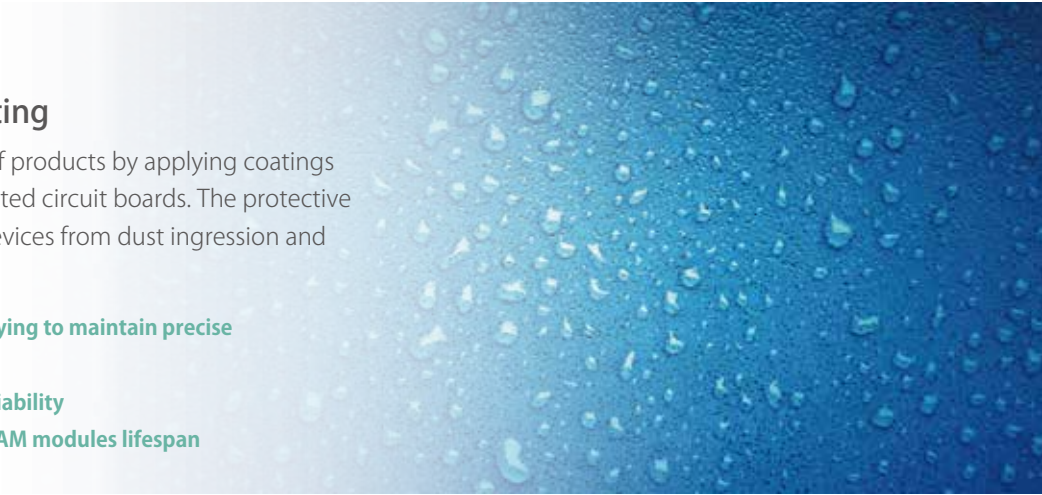
Dust/Moisture



Conformal Coating

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

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



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

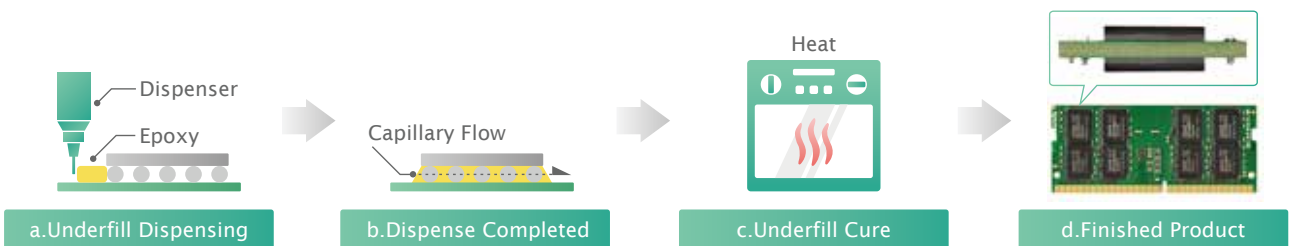
Shock / Vibration



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



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

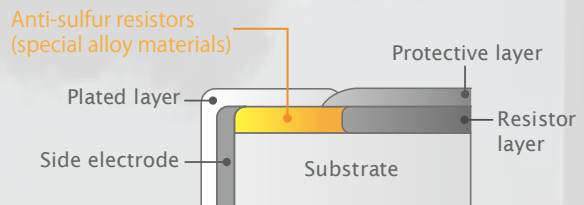


Widely recognized and awarded patents

	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.



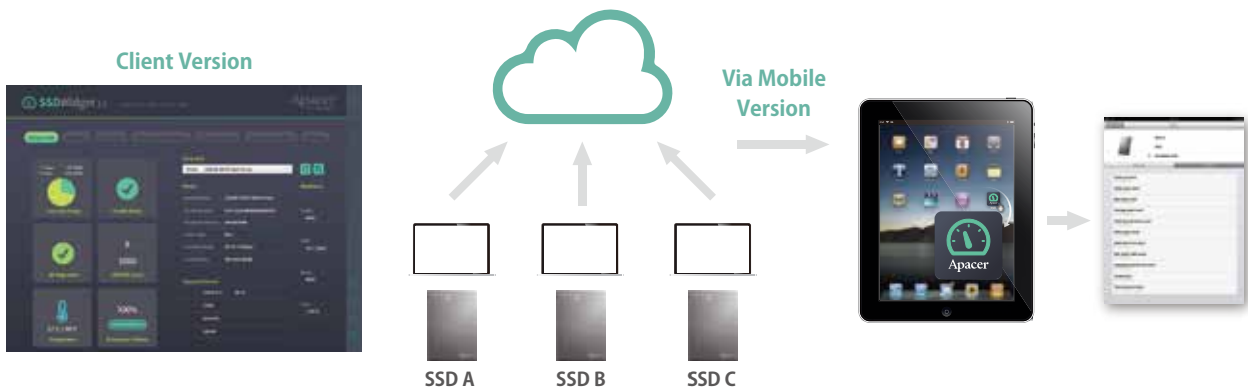
Value-Added Application



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

- Operation in wide temperature ranges
- Drastic changes in temperature, i.e. 10°C up or down in one minute

Solutions

- 2.5" SSD SM23D-25

Value-added technologies

- **Hardware:**
Component customization
Thermal shock testing
- **Firmware:**
Firmware customization

The Customer and the Application: Industrial Computers For Defense

Our customer is a globally competitive defense manufacturer in the US, offering robust industrial computers with rugged designs. Their latest product's exact nature was highly classified, but the client knew it was going to require SSDs that were tougher than most.



Challenges

The customer had initially tested some SSDs that had been designed to survive temperature changes from -40 to 85°C. However, they also knew they needed products that could function smoothly even when the temperature changed drastically within that range – for example, as much as 10 degrees up or down in one minute. And they knew that not all wide-temperature SSDs could survive these kinds of thermal shock tests.

They contacted Apacer to see if we could create a device that would meet these requirements, because they knew we had the testing equipment and the extensive firmware customization experience that this project would require.

Apacer's team went straight into action.

Solutions and Technologies

After selecting an existing product (2.5" SSD SM23D-25) from our extensive range of SSDs, Apacer's hardware customization team tackled the problem. They analyzed the voltage ripple on the SSD, and found that while it was good enough for the vast majority of applications, a reduction in voltage fluctuation would provide even greater stability. They then upgraded certain regulators and capacitors. Tests then proved that the voltage ripple was significantly reduced, by over 50% in one element and 65% in another. This meant voltage overall was much more stable and resistant to sudden swings in temperature.

Next up was Apacer's firmware customization team. They modified the SSD's firmware so that it would more frequently perform handshaking checks with the host. This ensured that a connection with the host was constantly confirmed, even when drastic temperature changes took place – greatly reducing the chance of the host losing contact with the SSD, and making data loss much less likely.

Finally the updated SSDs were subjected to stringent thermal shock tests that precisely emulated the punishing temperature swings that our client had laid down. They passed the tests with flying colors.

Results and Benefits:

The client received our first shipment of updated SSDs, and reported that they also passed their internal tests. Their final product became a hot item in the defense industry, famed for its reliability. And what's more, we incorporated the knowledge gleaned from this experience into our technology base. Apacer now applies stringent thermal shock tests to our DefensePro products so that they will be able to survive similarly drastic temperature changes. And we look forward to conducting similar customization and product tests for buyers like you.

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
defense 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)

Longevity

Fixed BOM support
Unique S/N for
RMA tracking

Strong R&D and
customization
capabilities

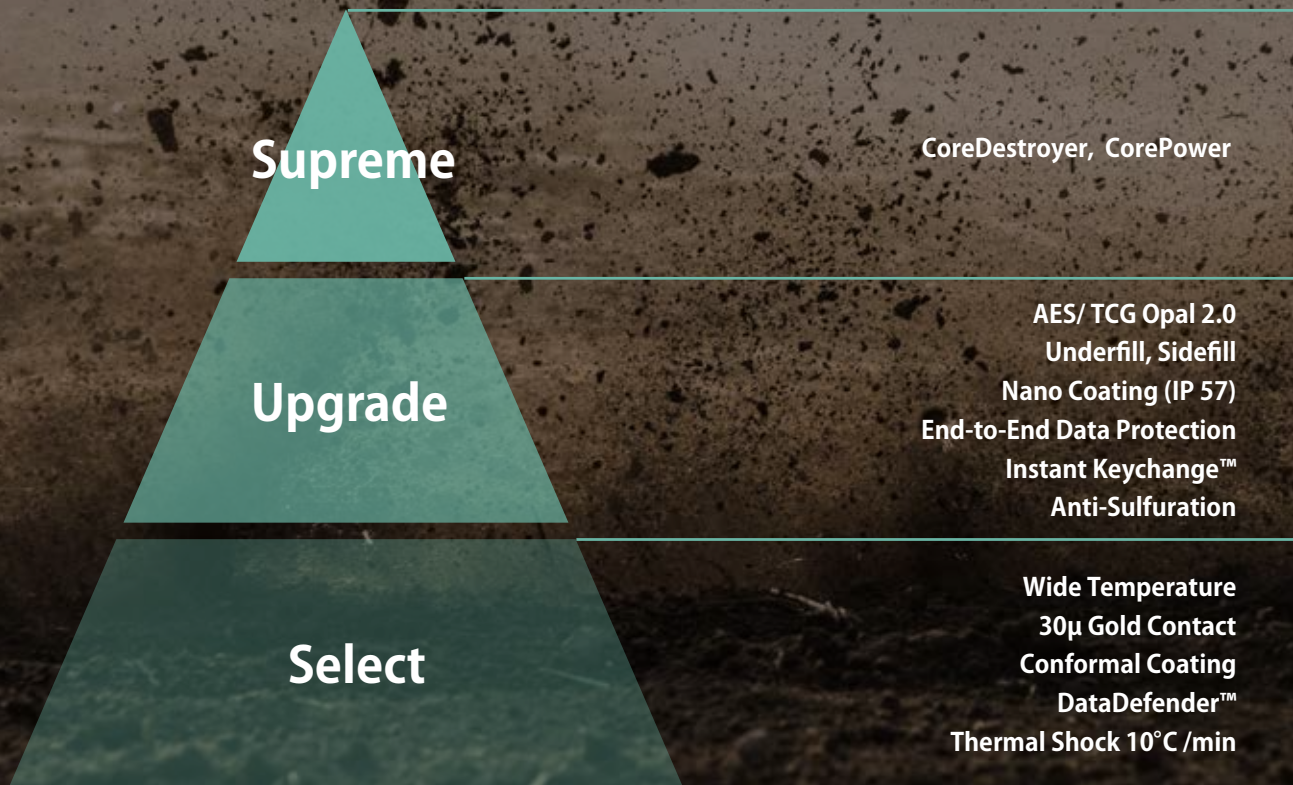
Apacer's Premium Package: DefensePro™

A Tailor-Made Technology Set for Defense Applications

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

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

DefensePro™



2.5" SSD



Solution	SM13D-25	SM23D-25	SM210-25 SM21P-25	SS13D-25	SS210-25 SS21P-25
Key feature	High capacity	TCG Opal 2.0	CorePower	High capacity, AES -256	CorePower
NAND Flash Type	MLC	MLC	MLC	SLC	SLC
Capacity	512GB to 2TB	32GB to 1TB	32GB to 512GB	32G to 512GB	8GB to 240GB
EST. Seq. R/W Performance (MB/sec)	530/355	560/510	510/380 505/470	520/515	530/445 550/440
IOPS (4K random write)	69K	65K	79K 81k	90K	76K
AES	Yes (AES-256)	Yes (AES-256)	-	Yes (AES-256)	-
TCG Opal 2.0	-	Yes	-	-	-
ATA Secure Erase	Yes	Yes	Yes	Yes	Yes
Instant Keychange	Yes	Yes	-	Yes	-
MIL Erase	NSA 9-12	8 standards	8 standards	NSA 9-12	8 standards
Write Protect	HW: Pin header, GPIO	HW: Pin header, GPIO; SW	HW: Pin header, GPIO; SW	HW: Pin header, GPIO	HW: Pin header, GPIO; SW
Destroy	HW: Pin header, GPIO	HW: Pin header, GPIO; SW	HW: Pin header, GPIO; SW	HW: Pin header, GPIO	HW: Pin header, GPIO; SW
End to End Protection	Yes	-	-	Yes	-
CorePower	-	-	Yes (SM21P-25)	-	Yes (SS21P-25)
Standard Operating Temperature (°C)	-40 ~ +85	-40 ~ +85	0 ~ 70 / -40 ~ +85	-40 ~ +85	0 ~ 70 / -40 ~ +85
Storage Temperature (°C)	-40 ~ +100	-40 ~ +100	-40 ~ +100	-40 ~ +100	-40 ~ +100
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)				
Humidity	5 ~ 95%, non-condensing	-	-	5 ~ 95%, non-condensing	-
Altitude	15,000 fts (compliant with MTL-STD-810G, Method 500.5)	-	-	15,000 fts (compliant with MTL-STD-810G, Method 500.5)	-
Thermal shock	10°C-min	-	10°C-min	10°C-min	-
MTBF	3,000,000	3,000,000	3,000,000	5,000,000	2,000,000
Dimension (mm)	100 x 69.75 x 9.3				
Power Consumption	Active mode: 1,040 mA / Idle mode: 95 mA	Active mode: 500 mA / Idle mode: 95 mA	Active mode: 1100 mA / Idle mode: 120 mA	Active mode: 1,200 mA / Idle mode: 80 mA	Active mode: 620 mA / Idle mode: 120 mA

M.2 2280 / M.2 2242



Solution	SM23D-M280	SM23P-M280	SM210-M280/ SM21P-M280	SM23D-M242	SS220-M242
Key feature	TCG Opal 2.0	CorePower	CorePower	TCG Opal 2.0	
NAND Flash Type	MLC	MLC	MLC	MLC	SLC
Capacity	32GB to 1TB	32GB to 512GB	32GB to 512GB	32GB to 256GB	1GB to 64GB
EST. Seq. R/W Performance (MB/sec)	560/510	560/510	560/510 535/155	555/470	555/450
IOPS (4K random write)	63K	55K	55K 19K	41K	77K
AES	Yes (AES-256)	Yes (AES-256)	-	Yes (AES-256)	-
TCG Opal 2.0	Yes (32-512GB)	Yes	-	Yes	-
ATA Secure Erase	Yes	Yes	Yes	Yes	Yes
Instant Keychange	Optional	Optional	-	Optional	-
MIL Erase	8 standards				
Write Protect	HW: GPIO; SW	HW: GPIO; SW	HW: GPIO; SW	HW: GPIO; SW	HW: GPIO; SW
Destroy	HW: GPIO; SW	HW: GPIO; SW	HW: GPIO; SW	HW: GPIO; SW	HW: GPIO; SW
CorePower	-	Yes	Yes (SM21P-M280)	-	-
Standard Operating Temperature (°C)	-40 ~ +85	0 ~ 70/ -40 ~ +85	-40 ~ +85	0 ~ 70/ -40 ~ +85	0 ~ 70/ -40 ~ +85
Storage Temperature (°C)	-40 ~ +100	-40 ~ +100	-40 ~ +100	-40 ~ +100	-40 ~ +100
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)				
Humidity	5 ~ 95%, non-condensing		-	5 ~ 95%, non-condensing	-
Altitude	15,000 fts (compliant with MTL-STD-810G, Method 500.5)		-	15,000 fts (compliant with MTL-STD-810G, Method 500.5)	-
Thermal shock	10°C/min	-	-	10°C/min	-
MTBF	3,000,000	3,000,000	1,000,000	3,000,000	1,000,000
Dimension (mm)	22 x 80 x 3.58	22 x 80 x 3.58	22 x 80 x 3.6	22 x 42 x 3.8	22 x 42 x 3.6
Power Consumption	Active mode: 695 mA / Idle mode: 135 mA	Active mode: 1090 mA / Idle mode: 160 mA	Active mode: 695 mA / Idle mode: 135 mA	Active mode: 695 mA / Idle mode: 135 mA	Active mode: 570 mA / Idle mode: 85 mA

MO-300 / uSSD








Solution	SM23D-300	SM23P-300	SS210-300	SV170-uSSD
Key feature	TCG Opal 2.0	CorePower		
NAND Flash Type	MLC	MLC	SLC	TLC
Capacity	32GB to 512GB	32GB to 512GB	2GB to 128GB	30GB to 120GB
EST. Seq. R/W Performance (MB/sec)	560/510	560/500	540/450	560/460
IOPS (4K random write)	58K	59K	76K	81K
AES	Yes (AES-256)	Yes (AES-256)	-	-
TCG Opal 2.0	Optional	Optional	-	-
ATA Secure Erase	Yes	Yes	Yes	Yes
Instant Keychange	Optional	Optional	-	-
MIL Erase	8 standards	8 standards	8 standards	-
Write Protect	HW: WP switch, GPIO; SW	HW: WP switch, GPIO; SW	HW: WP switch, GPIO; SW	Yes
Destroy	HW: GPIO; SW	HW: GPIO; SW	HW: GPIO; SW	-
CorePower	-	Yes	-	-
Standard Operating Temperature (°C)	-40 ~ +85	-40 ~ +85	0 ~ 70 / -40 ~ +85	0 ~ 70 / -40 ~ +85
Storage Temperature (°C)	-40 ~ +100	-40 ~ +100	-40 ~ +100	-40 ~ +100
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)			
Humidity	5 – 95%, non-condensing		-	-
Altitude	15,000 fts (compliant with MIL-STD-810G, Method 500.5)		-	-
Thermal shock	10°C/min		-	-
MTBF	3,000,000	3,000,000	2,000,000	1,000,000
Dimension (mm)	50.80 x 29.85 x 3.8	50.80 x 29.85 x 3.8	50.80 x 29.85 x 3.8	16 x 20 x 1.4
Power Consumption	Active mode: 925 mA / Idle mode: 125 mA	Active mode: 1095 mA / Idle mode: 185 mA	Active mode: 590 mA / Idle mode: 195mA	Active mode: 380 mA / Idle mode: 95 mA

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



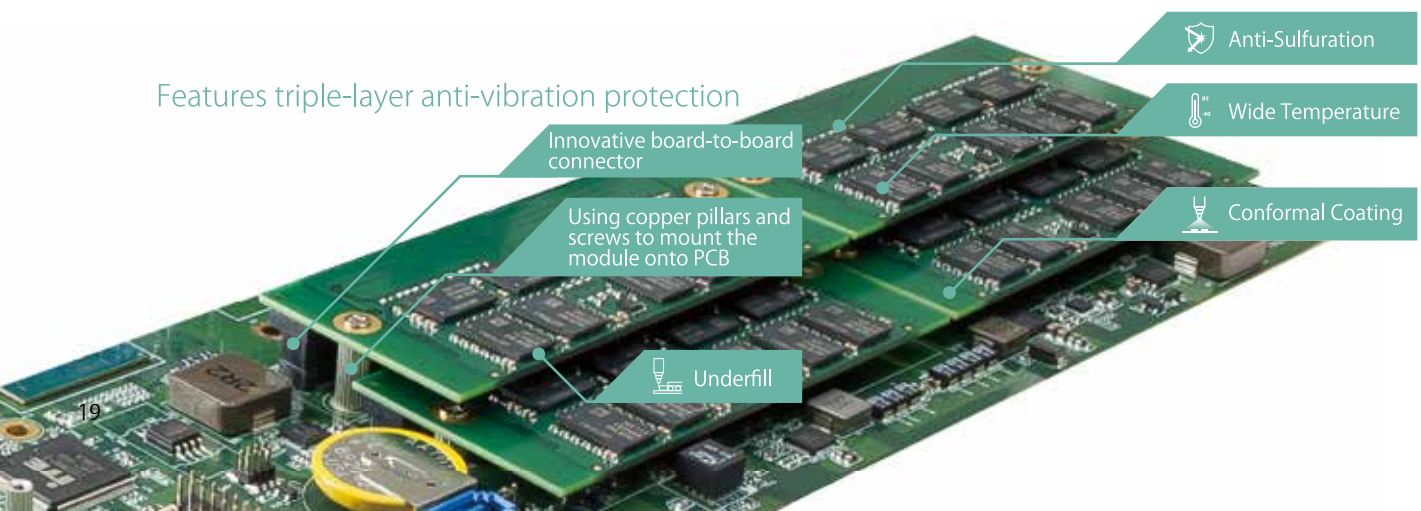
Model	DDR4 XR-DIMM
Module Type	XR-DIMM
Memory Technology	DDR4
Frequency	2133/2400
Density	8G/16G
Voltage	1.2v
Pin Count	300-Pin
Width	72-Bit
PCB Height	1.466"
Operation Temperature	TC=-40°C to 85°C
Value-Added	    

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



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	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°C to 85°C	TC=-40°C to 85°C	TC=-40°C to 85°C	TA=-40°C to 85°C
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°C to 85°C / -40°C to 85°C	TC=0°C to 85°C / -40°C to 85°C
Value-Added		

Rugged SODIMM



Model	DDR3 Rugged SODIMM	DDR2 Rugged SODIMM
Module Type	Rugged SODIMM	Rugged SODIMM
Memory Technology	DDR3	DDR2
Frequency	1066/1333/1600	533/667
Density	2G/4G/8G	512M/1G/2G
Voltage	1.35v/1.5v	1.8v
Pin Count	204-Pin	200-Pin
Width	64-Bit	64-Bit
PCB Height	1.55"	1.55"
Operation Temperature	TC=0°C to 85°C	TC=0°C to 85°C

Value-Added



32-bit SODIMM



Model	DDR4 32-Bits SODIMM	DDR3 32-Bits SODIMM
Module Type	32-Bits SODIMM	32-Bits 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°C to 85°C	TC=0°C to 85°C

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





The Most
Reliable
Storage and Memory
For
Industries

Global Presence

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