

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

## Gaming Solutions



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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

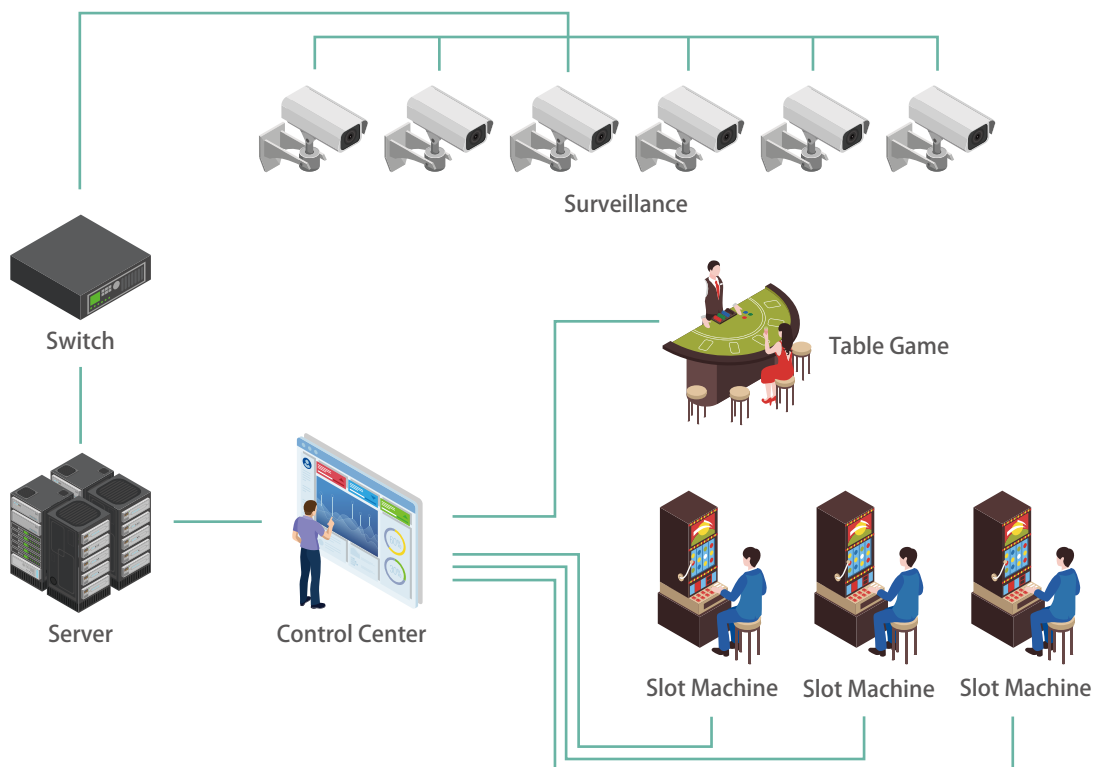
- A global-scale service and maintenance system
- Responsive local FAE technical support
- 24/7 flexible and quick delivery service
- Complete RMA system



# Challenges and Requirements for Gaming Applications

The gaming industry is growing rapidly, thanks to the loosening of restrictions on gaming throughout the modern world. And as it grows, the need for reliable, secure gaming machines becomes more important than ever. A machine is only as trustworthy as the components that make it up. That's why Apacer has stepped in to offer industrial grade storage and memory solutions to gaming machine manufacturers. Apacer's devices are powered by a variety of value-adding technologies that make them more reliable than ever.

## Gaming Applications







## Challenges and Requirements

Security is clearly a major concern for manufacturers of gaming machines. Precautions must be taken so that hardware remains invulnerable to hacking or other unauthorized access to prevent theft or misuse. That's why Apacer's industrial-grade products support the strongest encryption protocols, including TCG Opal 2.0 and AES-256.

Reliability is also a crucial selling point for gaming machines, since many of them will be operating 24/7 without much downtime for maintenance. Gaming machines often also require read-intensive operations. With both of these challenges in mind, Apacer developed the Smart Read Refresh™ technology. This prevents the accumulation of read-disturb errors from harming hardware operation and extends the operational lifetime of devices as a result.

# Featured Technologies for Gaming Applications

Having a gaming device fail at the wrong time could be extremely costly to a casino. To keep data safe and the money coming in, we're devoted to making our products as reliable and long-lasting as possible. An innovator in the field of industrial storage and memory, Apacer is committed to offering a wide range of industrial-grade SSD and DRAM solutions to buyers, as well as developing cutting-edge technologies for superior data protection.

## Security



- AES 256-bit Encryption
- TCG Opal 2.0
- Write Protect
- Signed Firmware

## Reliability & Endurance



- Over-provisioning
- DataDefender™
- CorePower
- SLC-lite
- SLC-liteX
- Wide Temperature
- Thermal Throttling
- Page Mapping
- Multi-PowerPath

## Data Integrity



- Smart Read Refresh™
- DataRAID™

## Longevity



- Fixed BOM
- 6+6 PCN/EOL Policy
- Double-barreled Solution
  - CoreAnalyzer2
  - SSDWidget 2.0



## 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.



## 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.

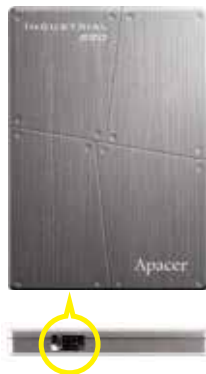
- AES 256-bit encryption
- 100 % hardware encryption
- Fast data encryption
- Pre-boot authentication
- LBA range assignment



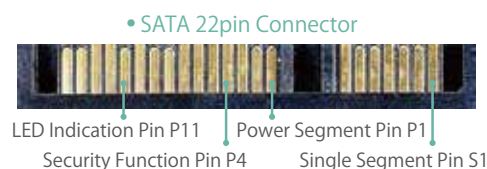
## Write Protect

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

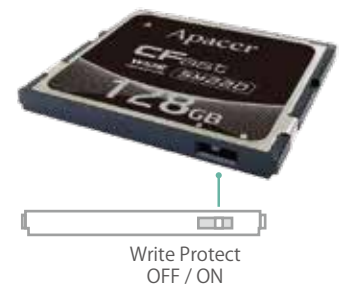
a. Pin Header



b. Pin Configuration



c. Slide Switch



## Signed Firmware

A digital signature that works inside firmware which can ensure the firmware comes from a trusted device and avoid malicious attacks.



## Reliability & Endurance



### Over-provisioning

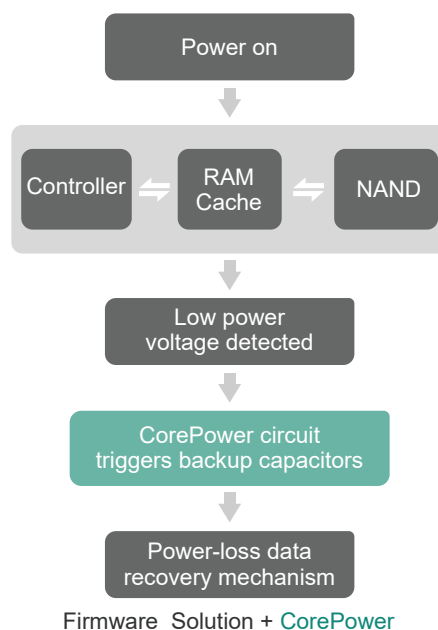
To reduce write amplification and increase endurance and performance, Apacer's SSDs support over-provisioning. The SSDs set aside a certain portion of the physical capacity of the memory to carry out garbage collection, wear-leveling and bad block mapping operations. The end result is a longer operating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



### 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





SLC  
liteX

## 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

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.



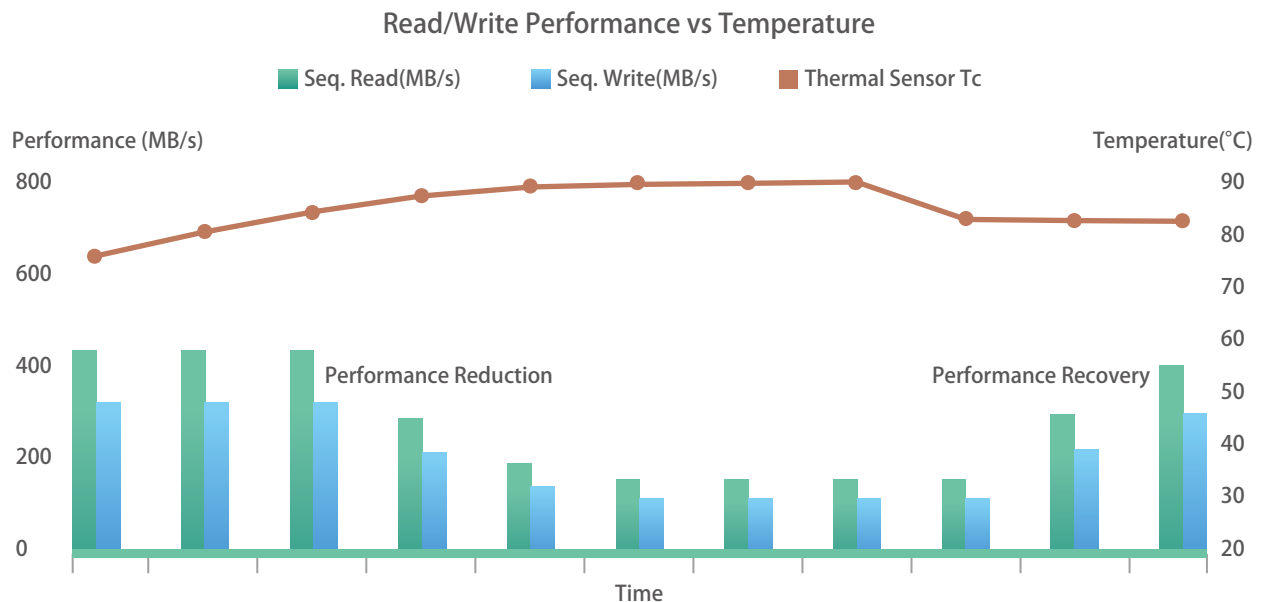
## Wide Temperature

Apacer's products are designed with wide temperature support to ensure reliable operation in extreme temperatures ranging from -40°C to 85°C.



## Thermal Throttling

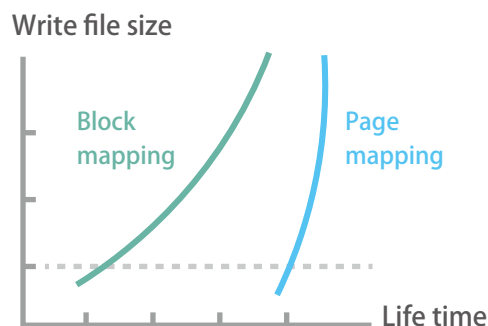
To prevent overheating, Apacer equips SSD products with a built-in thermal sensor to monitor the temperature of the SSD via S.M.A.R.T commands and configures the drive with firmware deployment of thermal throttling to manage the device temperature when responding to increased temperature conditions.





## 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.



## Multi-PowerPath

While a traditional 7-pin miniature SSD requires an external power supply, Apacer offers an alternative. Our patented plug-and-play Multi-PowerPath supplies power through two power connectors (7+2) on the side or through the 7th pin. This allows an SSD to operate without an external power supply, giving it the dual advantages of signal integrity and flexible configuration on the motherboard.



## Data Integrity



### **SMART Read Refresh™**

Apacer Smart Read Refresh™ plays a proactive role in avoiding read disturb errors from occurring to ensure 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 RAID™**

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.

## 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

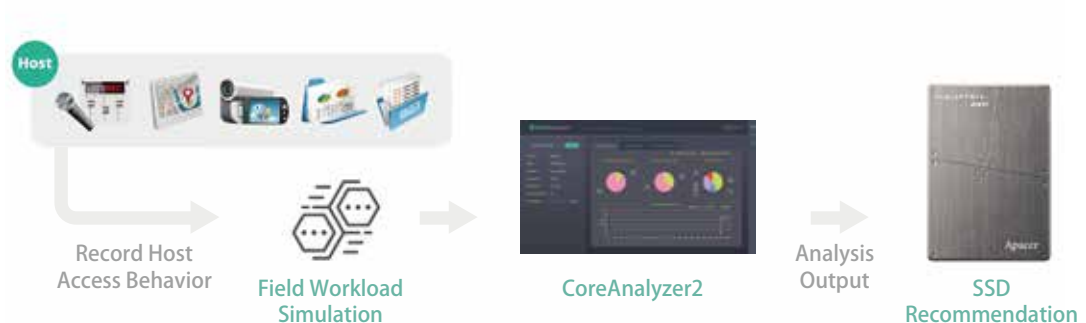
Anticipate and mitigate SSD failures remotely

Longer-lasting SSDs



### CoreAnalyzer2

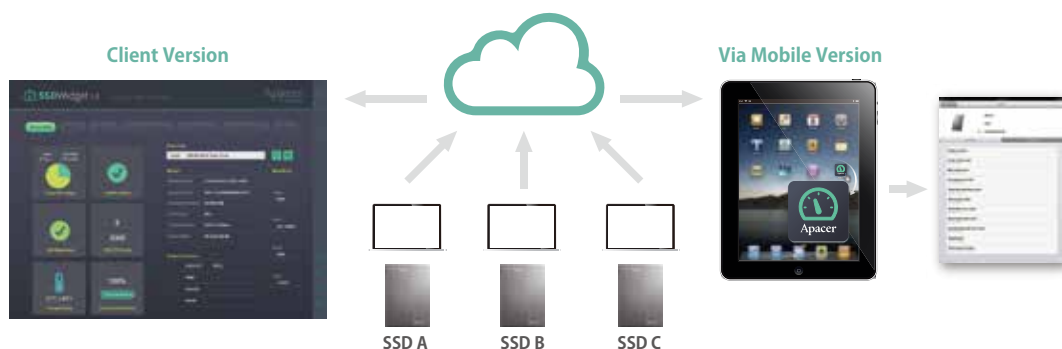
CoreAnalyzer is an exclusive, analytic data-behavior technology integrated with Apacer's SSD products. By collecting and analyzing data from a customer's host system, it can help customers analyze their usage behavior so they can choose the best-suited SSD for their application.



### 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

- Electro-static discharge
- Power cycling without standard controlled shutdown

## Solutions

- SDM7-M

## Value-added technologies

- **Hardware:**
- Protective plastic housings for SSDs
- Implementation of Apacer's CorePower technology

## The Customer and the Application: Gaming Machines

Our customer is an industry leader in the world of gaming machine manufacturing. Their systems are popular in high-end casinos around the world, so they demand only the finest components. But when they had a problem with their original supplier, they turned to Apacer to help them find a solution.



## Challenges

The customer sent Apacer's engineering team a batch of SSDs they had purchased from another supplier. All of the SSDs were damaged beyond repair, yet they had only been in use for six months or less. The customer had approached their original supplier and asked them to figure out the causes of the failures, but the original supplier could not come to any finite conclusions. Frustrated with this lack of practical feedback, the customer called Apacer, since they knew we were a veteran supplier of industrial-grade storage solutions with extensive experience in the gaming industry.

Having received the batch of damaged SSDs in the mail, Apacer's squad of engineers set to work to find out the root cause of the problem.

## Solutions and Technologies

Apacer's engineering team first determined that the SSDs had been damaged by electro-static discharge (ESD). This is a common phenomenon within complex electronic devices – static electricity builds up over time, and when it finally discharges, it's powerful enough to cause fatal damage to sensitive unprotected circuits.

Apacer's design team offered the customer a simple solution to this problem. They suggested encasing each SSD in a plastic housing to protect their circuits from ESD, and also to strengthen all the components of the PCB and upgrade certain converters and power ICs. This cost-effective approach could effectively ensure the SSDs would remain safe and operate without interruption.

There was another issue that Apacer's engineering team identified, in addition to ESD. They determined that in many cases, the customer's gaming machines were being power cycled without being shut down first. In other words, the end-users would not take the time to power down each machine individually. Rather, to save time, at the end of the working day, the power supply to multiple machines would be cut off without warning. Since a controlled shut down is an important part of prolonging a computing device's lifetime, repeated power cycling was taking an early toll on the customer's machines.

To combat this phenomenon, our team suggested that the customer incorporate Apacer's CorePower technology into their designs. This hardware- and firmware-based technology is designed to prevent data loss and ensure the stability of data transmission when power supply is unexpectedly cut off. The capacitor circuit design ensures sufficient time to move all cached data to NAND flash. The customer couldn't control how its end-users power-cycled their gaming machines, but with this technology in place, damage from power cycling would be completely eliminated.

## Results and Benefits:

The customer was very impressed with how Apacer's engineering team was able to quickly identify the problems that were plaguing their machines and to offer practical, affordable solutions to those problems. They started to design-in and phase in Apacer's SSDs to replace their previous supplier. They recognized that Apacer's extensive experience in the industry could help overcome any challenge they might encounter.

### 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  
gaming applications



RoHS



## 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: CasinoPro™

## A Tailor-made Technology Set for Casino Applications

Apacer has developed a tailor-made technology set, CasinoPro™, to meet the multi-faceted requirements of gaming applications and help customers find the right solutions for their circumstances, further simplifying the process of implementation.

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

## CasinoPro™

**CorePower**  
**Signed Firmware**  
**SLC-lite**  
**SLC-liteX**

**Over-provisioning**  
**AES 256**  
**Wide Temperature**

**SMART Read Refresh™**  
**Write Protect**  
**SSD Widget 2.0**



| Model                                | PV310-M280                                                                                                                                         | PV120-M280                                                                   | PV130-M242                                                                   | PV130-CFX                                |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------|
| Interface                            | PCIe Gen3 x4                                                                                                                                       | PCIe Gen3 x2                                                                 | PCIe Gen3 x2                                                                 | PCIe Gen3 x2                             |
| Connector                            | M.2 M key                                                                                                                                          | M.2 B & M key                                                                | M.2 B & M key                                                                | 21-pin male                              |
| Form Factor                          | M.2 2280                                                                                                                                           | M.2 2280                                                                     | M.2 2242                                                                     | CFX Type B Card                          |
| NAND Flash Type                      | 3D TLC                                                                                                                                             | 3D TLC                                                                       | 3D TLC                                                                       | 3D TLC                                   |
| Capacity                             | 120GB~960GB                                                                                                                                        | 120GB~960GB                                                                  | 60GB~480GB                                                                   | 120GB~480GB                              |
| DRAM Solution                        | Yes                                                                                                                                                | Yes                                                                          | No                                                                           | No                                       |
| Sustained Read Performance (MB/sec)  | UP to 3,290                                                                                                                                        | UP to 1,700                                                                  | UP to 1,600                                                                  | Up to 1550                               |
| Sustained Write Performance (MB/sec) | UP to 2,470                                                                                                                                        | UP to 1,000                                                                  | UP to 1,000                                                                  | Up to 950                                |
| 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     |
| IOPS (4K Random Write)               | 158K                                                                                                                                               | 182K                                                                         | 181K                                                                         | 170K                                     |
| 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                                                                          | -                                        |
| Shock                                | Operation: 50G/11ms (compliant with MIL-STD-202G)<br>Non-operation: 1500G/0.5ms (compliant with MIL-STD-883K)                                      |                                                                              |                                                                              |                                          |
| Vibration                            | Operation: 7.69 Grms, 20~2000 Hz/random (compliant with MIL-STD-810G)<br>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%                                                                   | 3.3V ± 5%                                |
| Power Consumption                    | Active mode: 2,120 mA<br>Idle mode: 255 mA                                                                                                         | Active mode: 1,040 mA<br>Idle mode: 140 mA                                   | Active mode: 785 mA<br>Idle mode: 135 mA                                     | Active mode: 970 mA<br>Idle mode: 135 mA |
| Dimension (mm )                      | 80.00 x 22.00 x 3.88                                                                                                                               | Single side:<br>80.00 x 22.00 x 2.38<br>Double side:<br>80.00 x 22.00 x 3.88 | Single side:<br>42.00 x 22.00 x 2.38<br>Double side:<br>42.00 x 22.00 x 3.88 | 29.6 x 38.5 x 3.8                        |
| MTBF (hours)                         | >1,000,000                                                                                                                                         | >1,000,000                                                                   | >1,000,000                                                                   | >1,000,000                               |

## 2.5 SSD



| Model                                | SV250-25                                                                                                                                        | SM230-25                                                                   | SM210-25                                                         | SM21P-25                                  | SU210-25                                                         |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------|------------------------------------------------------------------|
| Interface                            | SATA3.0(6Gb/s)                                                                                                                                  | SATA 3.1 (6Gb/s)                                                           | SATA 3.0 (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                           | (7+15) pin male                                                  |
| Form Factor                          | 2.5"                                                                                                                                            | 2.5"                                                                       | 2.5"                                                             | 2.5"                                      | 2.5"                                                             |
| NAND Flash Type                      | 3D TLC                                                                                                                                          | MLC                                                                        | MLC                                                              | MLC                                       | MLC                                                              |
| Capacity                             | 30GB~480GB                                                                                                                                      | With AES 256 support:<br>32GB~1TB<br>With TCG Opal 2.0 support: 32GB~512GB |                                                                  | 32GB~512GB                                | 16GB~256GB                                                       |
| DRAM Solution                        | No                                                                                                                                              | No                                                                         | Yes                                                              | Yes                                       | Yes                                                              |
| Sustained Read Performance (MB/sec)  | Up to 560                                                                                                                                       | Up to 530                                                                  | Up to 510                                                        | Up to 505                                 | Up to 545                                                        |
| Sustained Write Performance (MB/sec) | Up to 520                                                                                                                                       | Up to 520                                                                  | Up to 380                                                        | Up to 470                                 | Up to 450                                                        |
| 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                             |
| IOPS (4K Random Write)               | 73K                                                                                                                                             | 65K                                                                        | 79K                                                              | 81K                                       | 80K                                                              |
| 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                                                                                                                                             | Yes                                                                        | Yes                                                              | Optional                                  | Yes                                                              |
| Shock                                | Operating:50G/11ms,(compliant with MIL-STD-202G)<br>Non-operating: 1500G/0.5ms,(compliant with MIL-STD-883K)                                    |                                                                            |                                                                  |                                           |                                                                  |
| Vibration                            | Operating: 7.69 GRMS, 20~2000Hz/random,(compliant with MIL-STD-810G)<br>Non-operating: 4.02Grms,, 15~2000Hz/sine, (compliant with MIL-STD-810G) |                                                                            |                                                                  |                                           |                                                                  |
| Operating Voltage                    | 5.0 V ± 10%                                                                                                                                     | 5.0 V ± 5%                                                                 | 5.0 V ± 5%                                                       | 5.0 V ± 5%                                | 5.0 V ± 5%                                                       |
| Power Consumption                    | Active mode: 385 mA<br>Idle mode: 100 mA                                                                                                        | Active mode: 500 mA<br>Idle mode: 95 mA                                    | Active mode: 680 mA<br>Idle mode: 60 mA                          | Active mode: 1100 mA<br>Idle mode: 120 mA | Active mode: 560 mA<br>Idle mode: 75 mA                          |
| Dimension (mm)                       | 7mm:<br>100.00 x 69.85 x 6.90<br>9.5mm:<br>100.00 x 69.85 x 9.30                                                                                | 7mm:<br>100.00 x 69.85 x 6.90                                              | 7mm:<br>100.00 x 69.85 x 6.90<br>9.5mm:<br>100.00 x 69.85 x 9.30 | 9.5mm:<br>100.00 x 69.85 x 9.30           | 7mm:<br>100.00 x 69.85 x 6.90<br>9.5mm:<br>100.00 x 69.85 x 9.30 |
| MTBF (hours)                         | >1,000,000                                                                                                                                      | >1,200,000                                                                 | >1,000,000                                                       | >1,000,000                                | >1,000,000                                                       |

# M.2



| Model                                | SV250-M242                                                                                                                                         | SM230-M242                                 | SV250-M280                              | SM230-M280<br>SM23P-M280                   | SU230-M280                                 |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------------------------------|--------------------------------------------|--------------------------------------------|
| Interface                            | SATA 3.0 (6Gb/s)                                                                                                                                   | SATA 3.0 (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                              |
| Form Factor                          | M.2 2242                                                                                                                                           | M.2 2242                                   | M.2 2280                                | M.2 2280                                   | M.2 2280                                   |
| NAND Flash Type                      | 3D TLC                                                                                                                                             | MLC                                        | 3D TLC                                  | MLC                                        | MLC                                        |
| Capacity                             | 30GB~480GB                                                                                                                                         | 8GB~256GB                                  | 30GB~960GB                              | With AES 256 support: 32GB~1TB             | 32GB ~ 128GB                               |
| DRAM Solution                        | No                                                                                                                                                 | No                                         | No                                      | No                                         | No                                         |
| Sustained Read Performance (MB/sec)  | Up to 560                                                                                                                                          | Up to 525                                  | UP to 560                               | Up to 560                                  | Up to 560                                  |
| Sustained Write Performance (MB/sec) | Up to 520                                                                                                                                          | Up to 355                                  | UP to 525                               | Up to 510                                  | Up to 470                                  |
| ECC Engine                           | 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 72-bit per 1K bytes BCH ECC | Built-in up to 72-bit per 1K bytes BCH ECC |
| IOPS (4K Random Write)               | 75K                                                                                                                                                | 40K                                        | 75K                                     | 63K                                        | 57K                                        |
| 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                                                                                                                                                | Yes                                        | Yes                                     | Yes                                        | Yes                                        |
| Shock                                | Operation: 50G/11ms (compliant with MIL-STD-202G)<br>Non-operation: 1500G/0.5ms (compliant with MIL-STD-883K)                                      |                                            |                                         |                                            |                                            |
| Vibration                            | Operation: 7.69 Grms, 20~2000 Hz/random (compliant with MIL-STD-810G)<br>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: 405mA<br>Idle mode: 70 mA                                                                                                             | Active mode: 695mA<br>Idle mode: 135 mA    | Active mode: 455 mA<br>Idle mode: 80 mA | Active mode: 695mA<br>Idle mode: 135 mA    | Active mode: 740mA<br>Idle mode: 145 mA    |
| Dimension (mm )                      | 42.00 x 22.00 x 3.80                                                                                                                               | 42.00 x 22.00 x 3.80                       | 80.00 x 22.00 x 3.58                    | 80.00 x 22.00 x 2.23                       | 80.00 x 22.00 x 2.33                       |
| MTBF (hours)                         | >1,000,000                                                                                                                                         | >1,000,000                                 | >1,000,000                              | >1,000,000                                 | >1,000,000                                 |





| Model                                | SV170-CFast                                                                                                                                        | SM230-CFast                                | SM22P-CFast                              | SU230-CFast                                |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------------------------------------------|--------------------------------------------|
| Interface                            | SATA 3.0 (6Gb/s)                                                                                                                                   | SATA 3.0 (6Gb/s)                           | SATA 3.0 (6Gb/s)                         | SATA 3.0 (6Gb/s)                           |
| Connector                            | (7+17) pin male                                                                                                                                    | (7+17) pin male                            | (7+17) pin male                          | (7+17) pin male                            |
| Form Factor                          | CFast                                                                                                                                              | CFast                                      | CFast                                    | CFast                                      |
| NAND Flash Type                      | 3D TLC                                                                                                                                             | MLC                                        | MLC                                      | MLC                                        |
| Capacity                             | 30GB~480GB                                                                                                                                         | 8GB~256GB                                  | 8GB~128GB                                | 8GB ~ 128GB                                |
| DRAM Solution                        | No                                                                                                                                                 | No                                         | Yes                                      | No                                         |
| Sustained Read Performance (MB/sec)  | Up to 560                                                                                                                                          | Up to 560                                  | Up to 475                                | Up to 555                                  |
| Sustained Write Performance (MB/sec) | Up to 520                                                                                                                                          | Up to 465                                  | Up to 85                                 | Up to 475                                  |
| ECC Engine                           | Low-Density Parity-Check (LDPC) Code                                                                                                               | Built-in up to 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 |
| IOPS (4K Random Write)               | 84K                                                                                                                                                | 41K                                        | 16K                                      | 58K                                        |
| 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                                |
| H/W Write Protect                    | Yes                                                                                                                                                | Yes                                        | -                                        | Yes                                        |
| Thermal Sensor                       | Yes                                                                                                                                                | Yes                                        | Optional                                 | Yes                                        |
| Shock                                | Operation: 50G/11ms (compliant with MIL-STD-202G)<br>Non-operation: 1500G/0.5ms (compliant with MIL-STD-883K)                                      |                                            |                                          |                                            |
| Vibration                            | Operation: 7.69 Grms, 20~2000 Hz/random (compliant with MIL-STD-810G)<br>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: 355 mA<br>Idle mode: 90 mA                                                                                                            | Active mode: 645 mA<br>Idle mode: 135 mA   | Active mode: 610 mA<br>Idle mode: 140 mA | Active mode: 645 mA<br>Idle mode: 120 mA   |
| Dimension (mm)                       | 42.80 x 36.45 x 3.60                                                                                                                               | 42.80 x 36.45 x 3.60                       | 36.4 x 42.8 x 3.60                       | 42.80 x 36.45 x 3.60                       |
| MTBF (hours)                         | >1,000,000                                                                                                                                         | >1,000,000                                 | >1,000,000                               | >1,000,000                                 |

# SSD Module



| Model                                       | SV250-7LP2                                                                                                                                         | SDM7-M 7P/180D LP2(H)                                                   | SDM5A-M 7P/90D LP(H)                                                   | SDM5A-M 7P/180D LP5(H)                                                  | SDM5A 7P/270D N1                        |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------|
| <b>Interface</b>                            | SATA3.0(6Gb/s)                                                                                                                                     | SATA 3.0 (6Gb/s)                                                        | SATA 3.0 (6Gb/s)                                                       | SATA 3.0 (6Gb/s)                                                        | SATA 3.0 (6Gb/s)                        |
| <b>Connector</b>                            | 7-pin                                                                                                                                              | 7-pin                                                                   | 7-pin                                                                  | 7-pin                                                                   | 7-pin                                   |
| <b>Form Factor</b>                          | SATA Disk Module: 7-pin/180 degree                                                                                                                 | SATA Disk Module                                                        | SATA Disk Module                                                       | SATA Disk Module                                                        | SATA Disk Module                        |
| <b>NAND Flash Type</b>                      | 3D TLC                                                                                                                                             | MLC                                                                     | MLC                                                                    | MLC                                                                     | SLC                                     |
| <b>Capacity</b>                             | 60GB~240GB                                                                                                                                         | 8GB ~ 64GB                                                              | 4GB~32GB                                                               | 16GB ~ 64GB                                                             | 2GB~32GB                                |
| <b>DRAM Solution</b>                        | No                                                                                                                                                 | No                                                                      | No                                                                     | Yes                                                                     | No                                      |
| <b>Sustained Read Performance (MB/sec)</b>  | UP to 560                                                                                                                                          | UP to 135                                                               | Up to 120                                                              | Up to 435                                                               | Up to 65                                |
| <b>Sustained Write Performance (MB/sec)</b> | UP to 510                                                                                                                                          | UP to 90                                                                | Up to 40                                                               | Up to 80                                                                | Up to 105                               |
| <b>ECC Engine</b>                           | Low-Density Parity-Check (LDPC) Code                                                                                                               | Built-in 72-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    |
| <b>IOPS (4K Random Write)</b>               | 75K                                                                                                                                                | 22K                                                                     | -                                                                      | -                                                                       | -                                       |
| <b>Standard Operating Temperature (°C)</b>  | 0 ~ +70                                                                                                                                            | 0 ~ +70                                                                 | 0 ~ +70                                                                | 0 ~ +70                                                                 | 0 ~ +70                                 |
| <b>Wide Temperature (°C)</b>                | -40 ~ +85                                                                                                                                          | -40 ~ +85                                                               | -40 ~ +85                                                              | -40 ~ +85                                                               | -40 ~ +85                               |
| <b>Storage Temperature (°C)</b>             | -40 ~ +100                                                                                                                                         | -40 ~ +100                                                              | -40 ~ +100                                                             | -40 ~ +100                                                              | -40 ~ +100                              |
| <b>Housing</b>                              | No                                                                                                                                                 | Optional                                                                | Optional                                                               | Optional                                                                | No                                      |
| <b>H/W Write Protect</b>                    | Optional                                                                                                                                           | Optional                                                                | No                                                                     | Optional                                                                | Optional                                |
| <b>Screw Hole</b>                           | No                                                                                                                                                 | No                                                                      | No                                                                     | No                                                                      | Yes                                     |
| <b>Cable-less Solution</b>                  | Muti-PowerPath                                                                                                                                     | Muti-PowerPath                                                          | Optional (7+2 pin)                                                     | Muti-PowerPath                                                          | Optional (7+2 pin)                      |
| <b>Thermal Sensor</b>                       | Yes                                                                                                                                                | Yes                                                                     | -                                                                      | No                                                                      | -                                       |
| <b>Shock</b>                                | Operation: 50G/11ms (compliant with MIL-STD-202G)<br>Non-operation: 1500G/0.5ms (compliant with MIL-STD-883K)                                      |                                                                         |                                                                        |                                                                         |                                         |
| <b>Vibration</b>                            | Operation: 7.69 Grms, 20~2000 Hz/random (compliant with MIL-STD-810G)<br>Non-operation: 4.02 Grms, 15 ~ 2000 Hz/sine (compliant with MIL-STD-810G) |                                                                         |                                                                        |                                                                         |                                         |
| <b>Operating Voltage</b>                    | 5 V ± 5%                                                                                                                                           | 5.0 V ± 5%                                                              | 5.0 V ± 5%                                                             | 5.0 V ± 5%                                                              | 5.0 V ± 5%                              |
| <b>Power Consumption</b>                    | Active mode: 455 mA<br>Idle mode: 80 mA                                                                                                            | Active mode: 215 mA<br>Idle mode: 105 mA                                | Active mode: 160 mA<br>Idle mode: 65 mA                                | Active mode: 225 mA<br>Idle mode: 70 mA                                 | Active mode: 205 mA<br>Idle mode: 85 mA |
| <b>Dimension (mm)</b>                       | 33.00 x 29.30 x 8.85                                                                                                                               | Without housing: 35.2 x 30.4 x 9.25<br>With housing: 33.0 x 29.3 x 88.5 | Without housing: 30.0 x 20 x 15.2<br>With housing: 32.5 x 23.13 x 17.8 | Without housing: 35.2 x 30.4 x 9.25<br>With housing: 33.0 x 29.3 x 88.5 | 52.5 x 23.0 x 15.2                      |
| <b>MTBF (hours)</b>                         | >1,000,000                                                                                                                                         | >1,000,000                                                              | >1,000,000                                                             | >1,000,000                                                              | >2,000,000                              |

# Rugged DRAM Modules



## 1. Underfill:

Underfill strengthens DRAM ICs. During manufacturing, epoxy material is dispensed on a corner or along the edge of essential elements such as BGA/flip chips on PCB. This technique can reduce thermal stress damage and enhances product reliability.



## 2. Conformal Coating:

Conformal coating is a thin polymeric film that conforms to the contours of a printed circuit board to protect the board's components. It acts as a barrier against moisture, dust, chemicals, and extreme temperatures and can safeguard devices from dust ingress and liquid immersion.



## 3. 30µ Gold Finger

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



# Wide Temp. UDIMM / SODIMM



| Model                 | DDR4 Wide Temp. UDIMM                                                                 | DDR3 Wide Temp. UDIMM                                                                 | DDR4 Wide Temp. SODIMM                                                                 | DDR3 Wide Temp. SODIMM                                                                  |
|-----------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Module Type           | Wide Temperature UDIMM                                                                | Wide Temperature UDIMM                                                                | Wide Temperature SODIMM                                                                | Wide Temperature 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                                                                                  | 1.5v/1.35v                                                                            | 1.2v                                                                                   | 1.5v/1.35v                                                                              |
| 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=-40°C to 85°C                                                                      | TC=-40°C to 85°C                                                                      | TC=-40°C to 85°C                                                                       | TC=-40°C to 85°C                                                                        |
| Value-Added           |  30μ |  30μ |  30μ |  30μ |

# Wide Temp. ECC UDIMM / ECC SDIMM



| Model                 | DDR4 Wide Temp. ECC UDIMM                                                                                                                                                   | DDR3 Wide Temp. ECC UDIMM                                                                                                                                                   | DDR4 Wide Temp. ECC SODIMM                                                                                                                                                     | DDR3 Wide Temp. ECC SODIMM                                                                                                                                                      |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module Type           | Wide Temperature ECC UDIMM                                                                                                                                                  | Wide Temperature ECC UDIMM                                                                                                                                                  | Wide Temperature ECC SODIMM                                                                                                                                                    | Wide Temperature ECC 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                                                                                                                                                                      | 2G/4G/8G                                                                                                                                                                        |
| Voltage               | 1.2v                                                                                                                                                                        | 1.5v/1.35v                                                                                                                                                                  | 1.2v                                                                                                                                                                           | 1.5v/1.35v                                                                                                                                                                      |
| Pin Count             | 288-Pin                                                                                                                                                                     | 240-Pin                                                                                                                                                                     | 260-Pin                                                                                                                                                                        | 204-Pin                                                                                                                                                                         |
| Width                 | 72-Bit                                                                                                                                                                      | 72-Bit                                                                                                                                                                      | 72-Bit                                                                                                                                                                         | 72-Bit                                                                                                                                                                          |
| PCB Height            | 1.23                                                                                                                                                                        | 1.18                                                                                                                                                                        | 1.18                                                                                                                                                                           | 1.18                                                                                                                                                                            |
| Operation Temperature | TC=-40°C to 85°C                                                                                                                                                            | TC=-40°C to 85°C                                                                                                                                                            | TC=-40°C to 85°C                                                                                                                                                               | TC=-40°C to 85°C                                                                                                                                                                |
| Value-Added           |  30μ  |  30μ  |  30μ  |  30μ  |





## 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

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