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SP Silicon Power
INDUSTRIAL

INDUSTRIAL SOLUTIONS



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Leveraging over 22 years of experience, Silicon Power has become a trusted service-driven provider of professional NAND flash storage and DRAM modules for industrial and enterprise applications.

With a focus on in-house design, we develop SMART IoT Toolbox, chip-sorting technology, customized firmware adjustments, and personalized testing procedures under a strict project management system and in accordance with the NPI process. We maintain our competitive edge by understanding key design concerns for our customers and tailoring our products to make the best possible solutions for integration within our interconnected world.

With dedicated in-house manufacturing, we produce under rigorously monitored quality control measures and comprehensive testing systems. This allows for a 100% traceability via production record. In addition, our 90% automated manufacturing process allows us to maintain superior levels of consistency amongst our products.

Over the years, we've continued to sharpen our expertise in fulfilling unique customization requests and specialize in complete phase planning with fixed BOM solutions and an extended longevity supply. Our direct hand in design and manufacturing contributes to the dependability of these services.

In a world filled with commodity suppliers, Silicon Power stands out by delivering a combination of top-notch quality, reliability, and technical support for solutions to maximize potential.

Founded in
2003

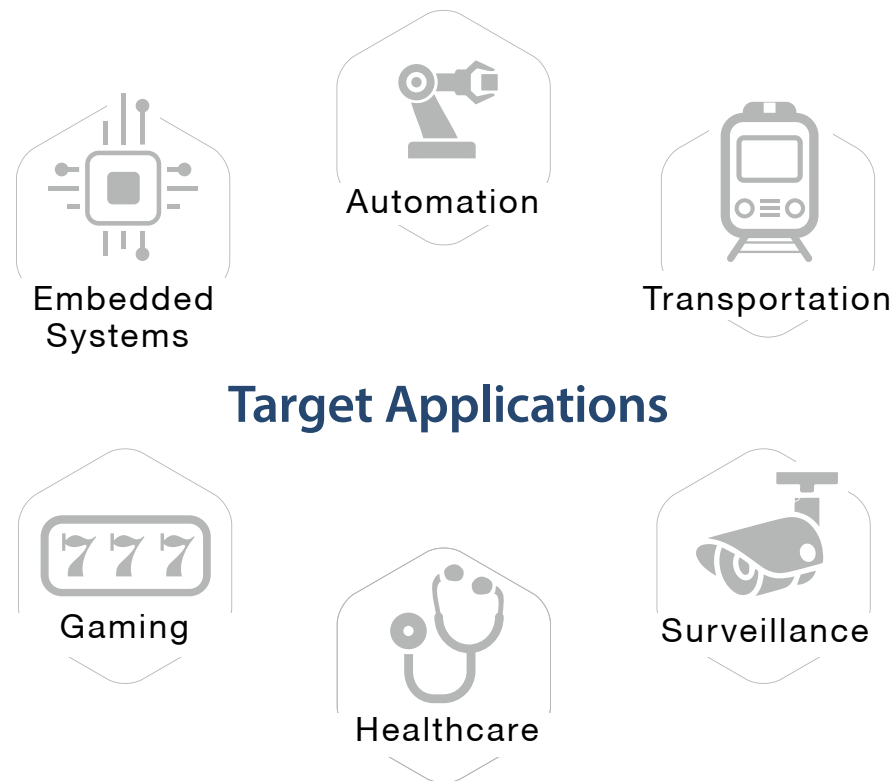

Made
 in Taiwan
 

Headquartered in
 Taipei, **Taiwan**


500+
 Employees
 

140+
 Global Awards
 

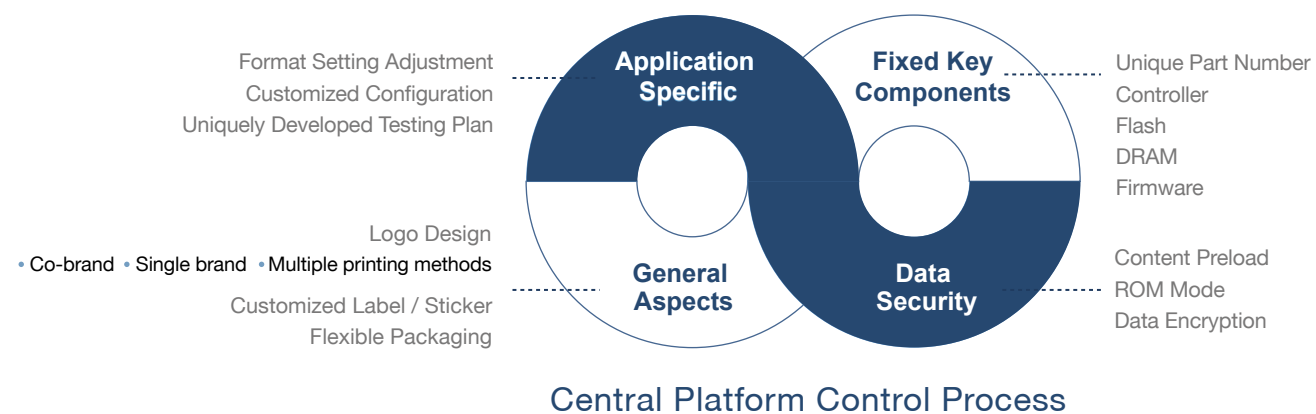
100+
 Country Sales
 Coverage
 



Service Customization

One of the most critical aspects of industrial applications is that each design is unique and performs a specific task, while the platform configuration is usually tailor-made and fixed. From the design phase to the end of the life cycle, the selected components are designed to remain unchanged to eliminate any compatibility risks.

This is why we only change our key components with well-in-advance ECN/PCN/EOL notices to provide enough time for a smooth re-qualification process and Last Time Buy (LTB) service. On top of BOM control, we offer different levels of customization services. Our expertise ranges from general customization to application-specific configurations, firmware adjustments, and personalized testing procedures.



Flexibility with Pseudo-SLC Flash and Industrial Temperature Solutions

Flexibility and a wide range of product options are essential parts of our portfolio, so you can easily find an embedded solution that is expertly tailored to your storage needs.

Pseudo-SLC Flash

Filling the gap between our SLC and MLC solutions, we offer pseudo-SLC flash. It is an advanced variant of MLC and outperforms MLC in speed, program erase cycles, and overall reliability. Pseudo-SLC operates like SLC but with fewer program erase cycles, which makes it a cost-effective alternative to SLC.

Industrial Temperature Solutions

Products with industrial applications often have to withstand extreme temperature conditions. We offer solutions that are able to operate in all systems and environments, including harsh operating environments and industries such as logistics and telecommunications.



SMART Toolbox

Utility application that monitors the health and status of our flash products (Windows and Linux).

SMART Embedded

Application including the C++ compiler development environment that offers seamless device integration (Windows and Linux Ubuntu/Yocto Embedded OS).

SMART IoT Notify

Windows desktop application that delivers e-mail notifications for SMART values such as 'Life Remaining' and 'SSD temperature are over threshold setting.'

SMART IoT Sphere

Cloud service with alarm and maintenance notifications that monitors and analyzes the health and status of our SSDs inside connected devices (Windows and Linux Ubuntu/Yocto).

SP Toolbox

Specifically developed for our industrial flash products, SP Toolbox is an intuitive software program with a range of powerful features. Easily change settings and efficiently monitor product health from one place - whatever you need to check or adapt to, SP Toolbox provides the exact tools that you need.

Dual Secure Design for Power Failure Protection

What is Power Failure Protection?

Power Failure Protection (PFP) is the methodology that protects data in an SSD against unexpected power loss during operation. When unexpected power loss occurs on an SSD, the SSD controller will perform a safety measure to protect the data from the DRAM buffer and save it into the NAND flash.

There are different types of data that are temporarily stored in DRAM cache memory to optimize SSD performance while the SSD is in operation, but DRAM is a volatile memory, which means DRAM always needs external power in order to retain its data.

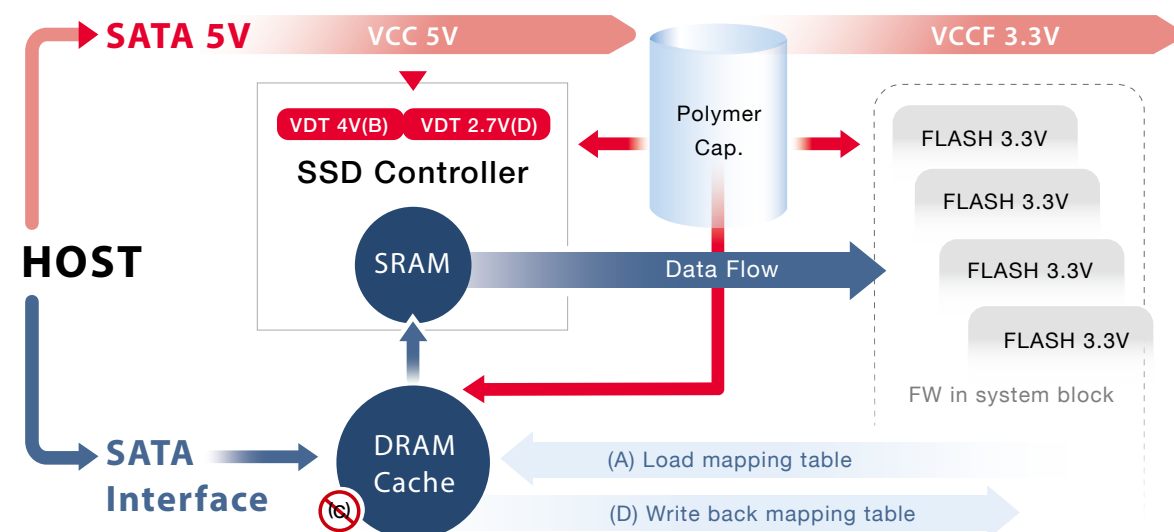
There are two ways for a user to power-off an SSD:

- ◆ In the normal power-off sequence: the host issues flush and standby commands to an SSD, the SSD flushes DRAM cache data into NAND flash, then powers off.
- ◆ In the unexpected power loss sequence: when an SSD power source changes from 5V ⇨ 4V, the SSD controller will enable the power shielding function to stop receiving host commands. As the power source drops from 4V ⇨ 2.7V, the SSD's advanced PFP function will enable a backup circuit and start to flush DRAM cache data into the NAND flash to secure the user data for a limited time.

Solving Power Failure with Dual Secure Design

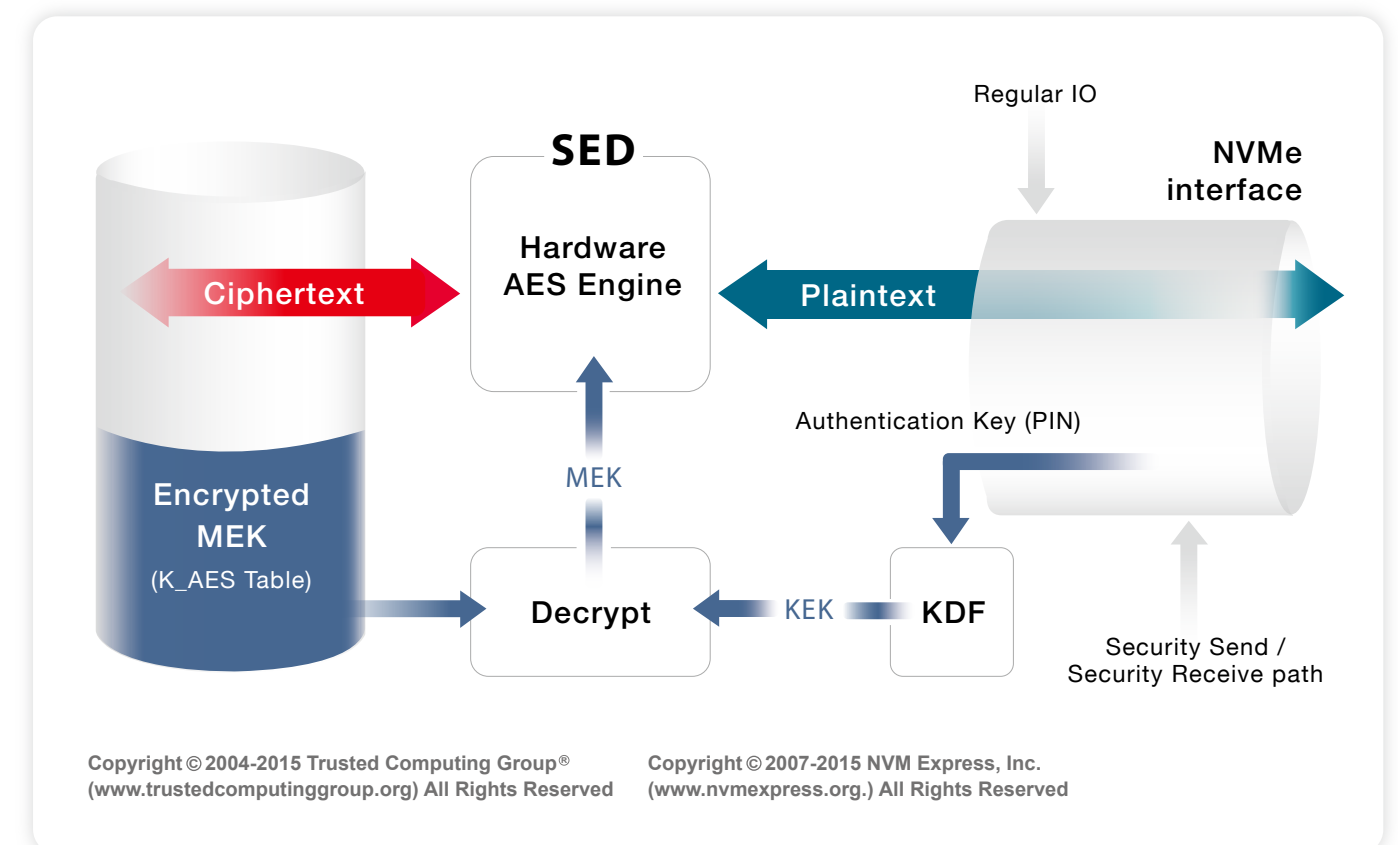
Our SSDs are equipped with power shielding firmware architecture protection to sense unstable voltage and power down to stop receiving host commands. We also implement Advanced PFP with industrial-grade polymer capacitors during sudden power-off situations to gain more time for the data flushing process from DRAM cache to NAND flash.

How Does the SSD Controller Manage Power Failure? (2.5"SSD R Series)



TCG/Opal 2.0 Compliant Self-Encrypting Drive (SED)

A Self-Encrypting Drive (SED) integrates encryption of user data at rest. All of the user data written to the drive is encrypted by specialized hardware implemented inside the drive's controller. The security and privacy benefits of SEDs are essential in the Internet of Things (IoT), medical devices, industrial systems, retail systems defense equipment, transportation systems, and more.



The Drive Trust Alliance brings together the state-of-the-art in SED technology. Storage device manufacturers, storage security software vendors, IT departments, and casual end users can employ SED technology to solve many of today's massive and serious data leakage problems.

The Drive Trust Alliance maintains the popular “sedutil” application, which eases the configuration of SEDs implementing the TCG/Opal specification for SATA and NVMe SEDs.

TCG/Opal SSC (Security Subsystem Class) 2.0 makes hardware encryption manageable. The specification standard stipulates that the hardware encryption is permanently active. Nowadays, TCG/Opal 2.0 is one of the main standards for SEDs.

Industrial SATA III and NVMe SSDs with TCG/Opal 2.0 Compliance

Our SATA III and NVMe SSDs are equipped with an AES-256 encryption engine, providing hardware-based, secure data encryption, with SED function support and zero SSD performance loss. If TCG/Opal features are enabled, these SSDs will follow the TCG/Opal specification and integrate encryption of user data at rest.

Anti-Sulfuration

Introduction

Sulfur corrosion-related failures with high levels of atmospheric pollution and high relative humidity levels are commonly found in Asia. This has led to increased rates of hardware failures associated with particulate and gaseous contamination. The growth of silver sulfide, resulting from silver corrosion, can especially cause an increase in resistance and eventually lead to an electrical open of the chip resistor.

There are two solutions to prevent the threat of sulfur corrosion. The first one is to make products more robust against sulfur corrosion. The best method to increase the robustness of resistors in high-sulfur environments is to employ anti-sulfur chip resistors. The second one is to gain a better understanding of the allowable levels of contamination, temperature, and humidity under which IT equipment can operate reliably. It is very important for our products to classify the robustness against sulfur corrosion for industrial applications, especially for networking equipment in data centers, IoT devices, and automotive and medical segments.

Methods of Anti-Sulfuration

There are several methods to elevate the anti-sulfur corrosion capabilities of electronics equipment, including anti-sulfur chip resistors and conformal coating applications.

The typical chip resistor with silver electrodes can be replaced with an anti-sulfur chip resistor. In addition, conformal coating is a system-level solution that can protect the board and its components to prevent sulfur corrosion.

According to the research paper "Evaluation of the Anti-Sulfur Corrosion Capacity for Chip Resistor and Conformal Coating by Way of Flower-of-Sulfur (FoS) Methodology," published in International Microsystems, Packaging Assembly and Circuits Technology Conference, the international standard of EIA-977 FoS test was adopted to evaluate the anti-sulfur corrosion capacity for chip resistors and conformal coating. Published in 2017, the EIA-977 FoS test is the latest sulfur corrosion qualification for the electronic passive components exposure to atmospheric sulfur. This test method is a modified form of ASTM B 809 and also suitable for electronic passive components exposure to atmospheric sulfur.

Anti-Sulfur Chip Resistors

Typical ship resistors with silver-based inner electrodes can lose conductivity when the silver reacts with sulfur in a high-sulfur environment. The electrodes can lose all conductivity and disconnect the circuit as sulfuration continues.

Anti-sulfur chip resistors and arrays are designed to protect against sulfuration of the resistor electrodes and pass FOS test method: ASTM B809-95 105°C, 750 hours.

Effectiveness of Anti-Sulfur Corrosion Capacity

DRAM modules with anti-sulfur chip resistors and arrays without conformal coating can survive for at least 600 hours (25 days), per the aforementioned research paper. According to ISA Standard 71.04, G2 is the most recognized severity level of airborne contaminants in developed regions for applications in data centers. Our DDR4 modules are ready to be equipped with industrial-grade anti-sulfur chip resistors and arrays to withstand G2 severity levels with a 3-year warranty.

Classification of Severity of Airborne Contaminants and Gases

The ISA standard 71.04-2013 was used as a guideline to classify the measured thickness of airborne contaminants into their various severity level rankings:

ISA Standard S71.04-2013			
Severity Level	Reactivity Level	Copper Corrosion	Silver Corrosion
G1	Mild	< 300 Angstroms / 30 days	< 200 Angstroms / 30 days
G2	Moderate	< 1000 Angstroms / 30 days	< 1000 Angstroms / 30 days
G3	Harsh	< 2000 Angstroms / 30 days	< 2000 Angstroms / 30 days
G4	Severe	> 2000 Angstroms / 30 days	> 2000 Angstroms / 30 days

ISA 71.04-G2 Severity Level	Expected Film Thickness for Corrosion	
	Silver (Ag)	Copper (Cu)
1-year warranty (12 months)	12,000	12,000
2-year warranty (24 months)	24,000	24,000
3-year warranty (36 months)	36,000	36,000

Conformal Coating

Benefits of Conformal Coating

Conformal coatings are the materials applied in thin layers onto printed circuit boards or other electronic substrates to protect against environmental damage, thermal shock damage, and mechanical damage to extend the life of the product.

Protects Against:

- ◆ Environmental damage such as humidity or corrosive chemicals
- ◆ Thermal shock damage such as thermal variations or shocks
- ◆ Mechanical shock damage such as vibrations or mechanical shocks

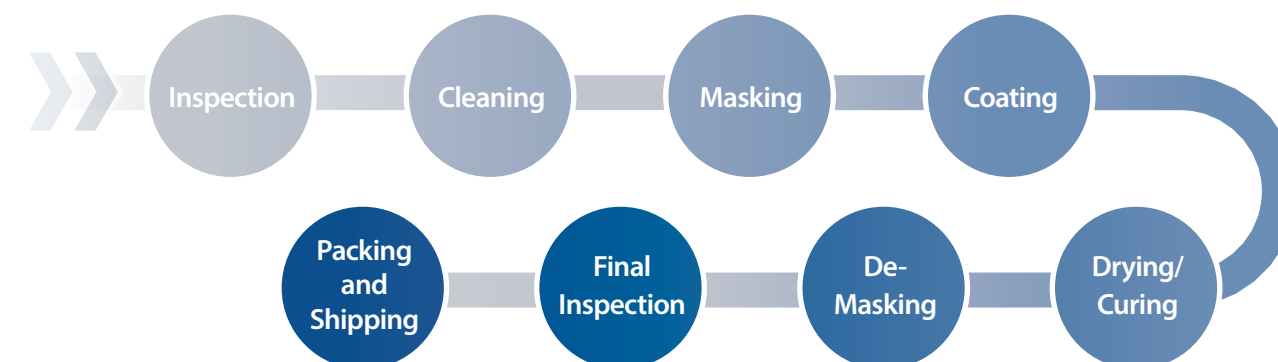
Globally Recognized Coating Materials

- ◆ UL-94 V-0 flammability rating, UL 746E recognized
- ◆ IPC-CC-830, MIL-I-46058C approved
- ◆ RoHS 2.0 compliant

Coating material	Thickness	Temp. Range	Humidity resistance	Dielectric properties	Abrasion resistance	Chemical & Solvent resistance	Easy to Repair
Acrylic HumiSeal 1B73, Peters SL 1307 FLZ/234	30um- 130um	Good -65 to +125°C	Good	Excellent	Good	Poor	Excellent
Silicone Dow Corning DC1-2577-LV	50um- 210um	Excellent -65 to +200°C	Fair	Good	Fair	Excellent	Poor

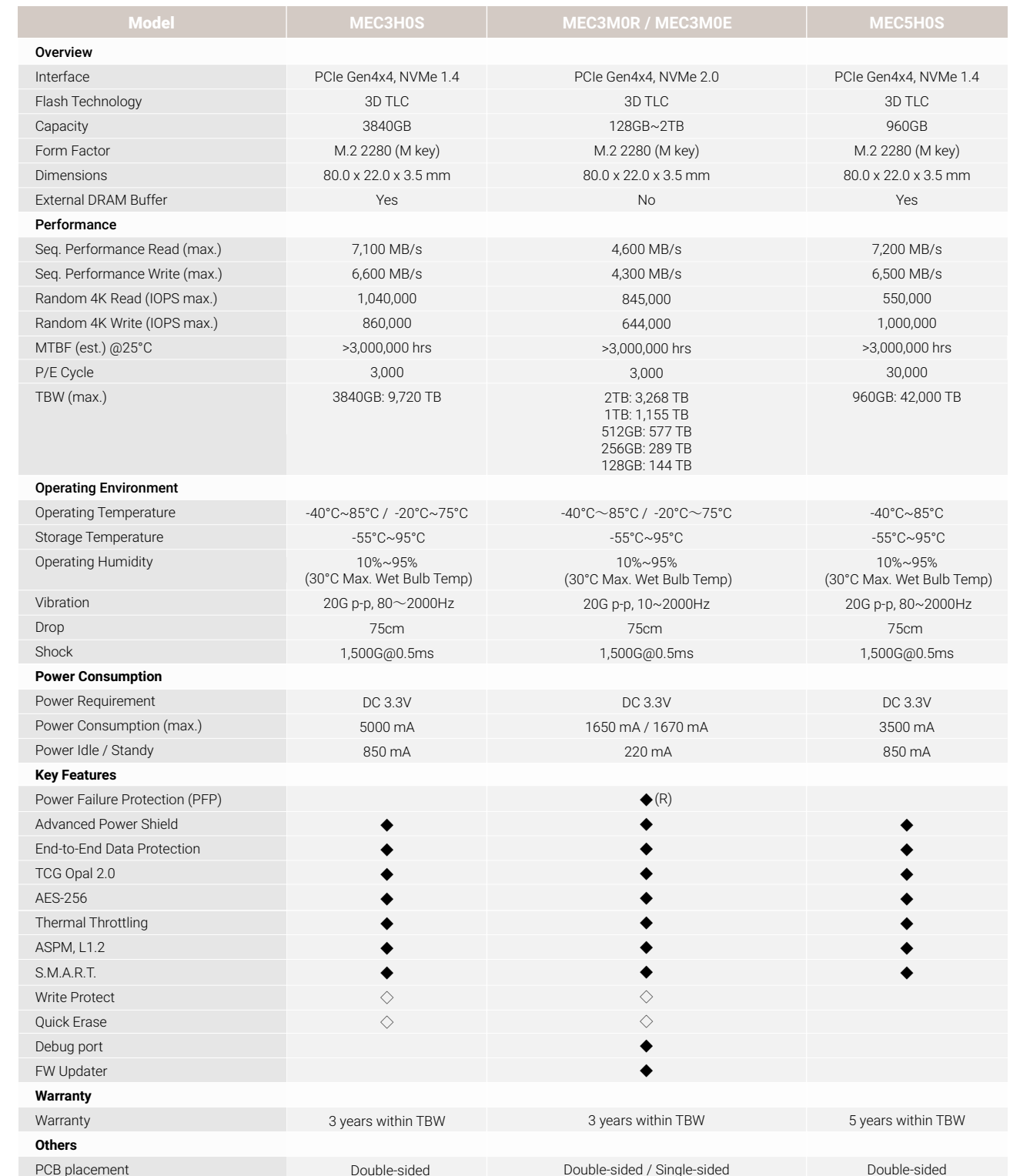
Reliable Conformal Coating Process

- ◆ Automatic Dispensing Machine to ensure a consistent coating process
- ◆ Compliance with IPC A-610 E2 conformal coating process standard and IPC A-610 E3 coating thickness standard





- NGFF M.2 (M Key) standard form factor
- Compliant with NVMe Express 1.4/1.3
- Supports data security with AES-256 Encryption (optional)
- Supports SP Toolbox S.M.A.R.T. health monitoring software



*3. = Default = By Request

M.2 2280 NVMe SSD

- NGFF M.2 (M Key) standard form factor
- Compliant with NVMe Express 1.4/1.3
- Supports data security with AES-256 Encryption (optional)
- Supports SP Toolbox S.M.A.R.T. health monitoring software



Model	MEC5M0E	MEC3F0S	MEC3K0E	MEC350S
Overview				
Interface	PCIe Gen4x4, NVMe 2.0	PCIe Gen3x4, NVMe 1.3	PCIe Gen3x4, NVMe 1.4	PCIe Gen3x4, NVMe 1.3
Flash Technology	pSLC (3D TLC)	3D TLC	3D TLC	3D TLC
Capacity	64GB~512GB	1TB~2TB	128GB~2TB	128GB~1TB
Form Factor	M.2 2280 (M key)	M.2 2280 (M key)	M.2 2280 (M key)	M.2 2280 (M key)
Dimensions	80.0 x 22.0 x 3.5 mm	80.0 x 22.0 x 3.5 mm	80.0 x 22.0 x 3.5 mm	80.0 x 22.0 x 3.5 mm
External DRAM Buffer	No	Yes	No	Yes
Performance				
Seq. Performance Read (max.)	4,700 MB/s	3,400 MB/s	2,600 MB/s	3,400 MB/s
Seq. Performance Write (max.)	4,100 MB/s	3,000 MB/s	2,000 MB/s	2,900 MB/s
Random 4K Read (IOPS max.)	858,000	670,000	230,000	345,000
Random 4K Write (IOPS max.)	654,000	650,000	200,000	350,000
MTBF (est.) @25°C	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs
P/E Cycle	100,000	3,000	3,000	3,000
TBW (max.)	512GB: 27,237 TB 256GB: 9,623 TB 128GB: 4,811 TB 64GB: 2,406 TB 32GB: 1,170 TB	2TB: 2,720 TB 1TB: 1,340 TB	2TB: 4,975 TB 1TB: 2,488 TB 512GB: 1,233 TB 256GB: 615 TB 128GB: 307 TB	1TB: 3,000 TB 512GB: 1500 TB 256GB: 750 TB 128GB: 375 TB
Operating Environment				
Operating Temperature	-40°C~85°C	-20°C~75°C	-20°C~75°C	-40°C~85°C / -20°C~75°C
Storage Temperature	-55°C~95°C	-55°C~95°C	-55°C~95°C	-55°C~95°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)
Vibration	20G p-p, 10~2000Hz	20G p-p, 80~2000Hz	20G, 10~2000Hz	20G, 10~2000Hz
Drop	75cm	75cm	75cm	75cm
Shock	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms
Power Consumption				
Power Requirement	DC 3.3V	DC 3.3V	DC 3.3V	DC 3.3V
Power Consumption (max.)	1650mA	2450 mA	1500 mA	2450 mA
Power Idle / Standby	220mA	670 mA	280 mA	230 mA
Key Features				
Power Failure Protection (PFP)				
Advanced Power Shield	◆	◆	◆	◆
End-to-End Data Protection	◆	◆	◆	◆
TCG Opal 2.0	◆	◇		◇
AES-256	◆	◆	◆	◆
Thermal Throttling	◆	◆	◆	◆
ASPM, L1.2	◆	◆	◆	◆
S.M.A.R.T.	◆	◆	◆	◆
Write Protect	◇		◇	
Quick Erase	◇		◇	
Debug port	◆		◆	
FW Updater	◆		◆	
Warranty				
Warranty	5 years within TBW	3 years within TBW	3 years within TBW	3 years within TBW
Others				
PCB placement	Single-sided	Double-sided	Double-sided	Double-sided

*1. The read and write values may vary depending on different capacities and testing platforms.
*2. MTBF (est.) @ 25°C (MIL-HDBK-217F parts count method / Telcordia SR-332 method)
*3. ◆=Default ◇=By Request

M.2 2242 NVMe SSD

- NGFF M.2 (M Key) standard form factor
- Compliant with NVMe Express 1.4/1.3
- Supports data security with AES-256 Encryption (optional)
- Supports SP Toolbox S.M.A.R.T. health monitoring software



Model	MEA3K0E	MEA3K0E (B+M Key)	MEA3M0E	MEA5M0E
Overview				
Interface	PCIe Gen3x4, NVMe 1.4	PCIe Gen3x2, NVMe 1.4	PCIe Gen4x4, NVMe 2.0	PCIe Gen4x4, NVMe 2.0
Flash Technology	3D TLC	3D TLC	3D TLC	pSLC (3D TLC)
Capacity	128GB~1TB	64GB~1TB	128GB~2TB	64GB~512GB
Form Factor	M.2 2242 (M key)	M.2 2242 (B+M key)	M.2 2242 (M key)	M.2 2242 (M key)
Dimensions	42.0 x 22.0 x 3.5 mm	42.0 x 22.0 x 3.5 mm	42.0 x 22.0 x 3.5 mm	42.0 x 22.0 x 3.5 mm
External DRAM Buffer	No	No	No	No
Performance				
Seq. Performance Read (max.)	3,100 MB/s	1,780 MB/s	4,700 MB/s	4,700 MB/s
Seq. Performance Write (max.)	2,000 MB/s	1,770 MB/s	4,400 MB/s	3,300 MB/s
Random 4K Read (IOPS max.)	271,000	251,000	858,000	858,000
Random 4K Write (IOPS max.)	284,000	258,000	622,000	654,000
MTBF (est.) @25°C	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs
P/E Cycle	3,000	3,000	3,000	100,000
TBW (max.)	1TB: 2,488 TB 512GB: 1,233 TB 256GB: 615 TB 128GB: 307 TB	1TB: 2,488 TB 512GB: 1,233 TB 256GB: 615 TB 128GB: 307 TB 64GB: 154 TB	2TB: 3,268 TB 1TB: 1,155 TB 512GB: 577 TB 256GB: 289 TB 128GB: 144 TB	512GB: 27,237 TB 256GB: 9,623 TB 128GB: 4,811 TB 64GB: 2,406 TB 32GB: 1,170 TB
Operating Environment				
Operating Temperature	-20°C~75°C	-40°C~85°C / -20°C~75°C	-40°C~85°C / -20°C~75°C	-40°C~85°C
Storage Temperature	-55°C~95°C	-55°C~95°C	-55°C~95°C	-55°C~95°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)
Vibration	20G, 10~2000Hz	20G , 10~2000Hz	20G p-p, 10~2000Hz	20G p-p, 10~2000Hz
Drop	75cm	75cm	75cm	75cm
Shock	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms
Power Consumption				
Power Requirement	DC 3.3V	DC 3.3V	DC 3.3V	DC 3.3V
Power Consumption (max.)	1890mA	1890 mA	1670mA	1650 mA
Power Idle / Standby	<170mA	<170 mA	220 mA	220 mA
Key Features				
Power Failure Protection (PFP)				
Advanced Power Shield	◆	◆	◆	◆
End-to-End Data Protection	◆	◆	◆	◆
TCG Opal 2.0			◆	◆
AES-256	◆	◆	◆	◆
Thermal Throttling	◆	◆	◆	◆
ASPM, L1.2	◆	◆	◆	◆
S.M.A.R.T.	◆	◆	◆	◆
Write Protect	◇		◇	◇
Quick Erase	◇		◇	◇
Debug port	◆	◆	◆	◆
FW Updater	◆	◆	◆	◆
Warranty				
Warranty	3 years within TBW	3 years within TBW	3 years within TBW	5 years within TBW
Others				
PCB placement	Double-sided	Double-sided	Single-sided	Single-sided

*1. The read and write values may vary depending on different capacities and testing platforms.
*2. MTBF (est.) @ 25°C (MIL-HDBK-217F parts count method / Telcordia SR-332 method)
*3. ◆=Default ◇=By Request

M.2 2230 NVMe SSD

- NGFF M.2 (M Key) standard form factor
- Compliant with NVMe Express 1.4/1.3
- Supports data security with AES-256 Encryption (optional)
- Supports SP Toolbox S.M.A.R.T. health monitoring software



Model	MEM3K0E	MEM3K0E (E key)
Overview		
Interface	PCIe Gen3x4, NVMe 1.4	PCIe Gen3x1, NVMe 1.4
Flash Technology	3D TLC	3D TLC
Capacity	64GB~512GB	64GB~1TB
Form Factor	M.2 2230 (M key)	M.2 2230 (E key)
Dimensions	30.0 x 22.0 x 3.5 mm	30.0 x 22.0 x 3.5 mm
External DRAM Buffer	No	No
Performance		
Seq. Performance Read (max.)	1180 MB/s	890 MB/s
Seq. Performance Write (max.)	800 MB/s	880 MB/s
Random 4K Read (IOPS max.)	73,000	140,000
Random 4K Write (IOPS max.)	150,000	200,000
MTBF (est.) @25°C	>3,000,000 hrs	>3,000,000 hrs
P/E Cycle	3,000	3,000
TBW (max.)	512GB: 1,233 TB 256GB: 615 TB 128GB: 307 TB 64GB: 154 TB	1TB: 2,488 TB 512GB: 1,233 TB 256GB: 615 TB 128GB: 307 TB 64GB: 154 TB
Operating Environment		
Operating Temperature	-20°C~75°C	-40°C~85°C / -20°C~75°C
Storage Temperature	-55°C~95°C	-55°C~95°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)
Vibration	20G, 10~2000Hz	20G, 10~2000Hz
Drop	75cm	75cm
Shock	1,500G@0.5ms	1,500G@0.5ms
Power Consumption		
Power Requirement	DC 3.3V	DC 3.3V
Power Consumption (max.)	1420mA	1420 mA
Power Idle / Standby	130mA	130 mA
Key Features		
Power Failure Protection (PFP)		
Advanced Power Shield	◆	◆
End-to-End Data Protection	◆	◆
TCG Opal 2.0		
AES-256	◆	◆
Thermal Throttling	◆	◆
ASPM, L1.2	◆	◆
S.M.A.R.T.	◆	◆
Write Protect		
Quick Erase		
Debug port	◆	◆
FW Updater	◆	◆
Warranty		
Warranty	3 years within TBW	3 years within TBW
Others		
PCB placement	Double-sided	Double-sided

*1. The read and write values may vary depending on different capacities and testing platforms.
*2. MTBF (est.) @ 25°C (MIL-HDBK-217F parts count method / Telcordia SR-332 method)
*3. ◆=Default ◇=By Request

2.5" SATA SSD

- 2.5 inch form factor with 7mm thickness
- Compliant with Serial ATA Revision 3.1 Standard with 6.0 Gb/s transfer rate
- Equipped with advanced PFP technology (optional)
- Supports data security with AES-256 Encryption (optional)
- Feature connector supports Security Erase and Write Protect
- Supports SP Toolbox S.M.A.R.T. health monitoring system software



Model	SSD3F0R/S	SSD3K0E	SSD3M0R/E	SSD350R/S
Overview				
Interface	SATA III/6.0Gbps	SATA III/6.0Gbps	SATA III/6.0Gbps	SATA III/6.0Gbps
Flash Technology	3D TLC	3D TLC	3D TLC	3D TLC
Capacity	3.8TB~7.6TB	64GB~2TB	120GB~1.9TB	128GB~2TB / 64GB~3.8TB
Form Factor	2.5 inch (7mm)	2.5 inch (7mm)	2.5 inch (7mm)	2.5 inch (7mm)
Dimensions	100.4 x 69.9 x 6.8 mm	100.4 x 69.9 x 6.8 mm	100.4 x 69.9 x 6.8 mm	100.4 x 69.9 x 6.8 mm
External DRAM Buffer	Yes	No	No	Yes
Performance				
Seq. Performance Read (max.)	550 MB/s	540 MB/s	560 MB/s	560 MB/s
Seq. Performance Write (max.)	520 MB/s	520 MB/s	500 MB/s	520 MB/s
Random 4K Read (IOPS max.)	98,000	29,000	55,000	95,000
Random 4K Write (IOPS max.)	88,000	85,000	65,000	91,000
MTBF (est.) @25°C	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs
P/E Cycle	3,000	3,000	3,000	3,000
TBW (max.)	7,680GB: 14,000 TB 3,840GB: 7,000 TB	2TB: 4,419TB 1TB: 2,209TB 512GB: 1,105TB 256GB: 551TB 128GB: 276TB 64GB: 139TB	1,920TB: 3,795TB 960GB: 1,382TB 480GB: 691TB 240GB: 346TB 120GB: 173TB	3.8TB: 10,287 TB 2TB: 5,486 TB 1TB: 2,743 TB 512GB: 1,372 TB 256GB: 686 TB 128GB: 343 TB 64GB: 176 TB
Operating Environment				
Operating Temperature	-40°C~85°C / -20°C~75°C	-20°C~75°C	-40°C~85°C / -20°C~75°C	-40°C~85°C / -20°C~75°C
Storage Temperature	-55°C~95°C	-55°C~95°C	-55°C~95°C	-55°C~95°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)
Vibration	20G (Peak-to-Peak), 80~2000 Hz	20G , 10~2000Hz	20G (Peak-to-Peak), 10~2000Hz	20G, 10~2000Hz
Drop	75cm	75cm	75cm	75cm
Shock	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms
Power Consumption				
Power Requirement	DC 5.0V	DC 5.0V	DC 5.0V	DC 5.0V
Power Consumption (max.)	750 mA / 600 mA	340 mA	320 mA	700 mA
Power Idle / Standby	250 mA / 240 mA	85 mA	140 mA	110 mA
Key Features				
Power Failure Protection (PFP)	◆(R)		◆(R)	◆(R)
Advanced Power Shield	◆	◆	◆	◆
End-to-End Data Protection	◆			◆
TCG Opal 2.0	◇			◇
AES-256	◆	◆	◆	◇
Thermal Throttling	◆	◆	◆	◆
DEVSLP	◆	◆	◆	◆
S.M.A.R.T.	◆	◆	◆	◆
Write Protect				
Quick Erase				
Debug port		◆	◆	
FW Updater		◆	◆	
Warranty				
Warranty	3 years within TBW	3 years within TBW	3 years within TBW	3 years within TBW

*1. The read and write values may vary depending on different capacities and testing platforms.
*2. MTBF (est.) @ 25°C (MIL-HDBK-217F parts count method / Telcordia SR-332 method)
*3. ◆=Default ◇=By Request

2.5" SATA SSD

- 2.5 inch form factor with 7mm thickness
- Compliant with Serial ATA Revision 3.1 Standard with 6.0 Gb/s transfer rate
- Equipped with advanced PFP technology (optional)
- Supports data security with AES-256 Encryption (optional)
- Feature connector supports Security Erase and Write Protect
- Supports SP Toolbox S.M.A.R.T. health monitoring system software



Model	SSD300R	SSD500R	SSD550R/S	SSD700R
Overview				
Interface	SATA III/6.0Gbps	SATA III/6.0Gbps	SATA III/6.0Gbps	SATA III/6.0Gbps
Flash Technology	MLC	pSLC (MLC)	pSLC (3D TLC)	SLC
Capacity	32GB~1TB	16GB~512GB	32GB~512GB	16GB~256GB
Form Factor	2.5 inch (7mm)	2.5 inch (7mm)	2.5 inch (7mm)	2.5 inch (7mm)
Dimensions	100.4 x 69.9 x 6.8 mm	100.4 x 69.9 x 6.8 mm	100.4 x 69.9 x 6.8 mm	100.4 x 69.9 x 6.8 mm
External DRAM Buffer	Yes	Yes	Yes	Yes
Performance				
Seq. Performance Read (max.)	520 MB/s	520 MB/s	560 MB/s	190 MB/s
Seq. Performance Write (max.)	450 MB/s	300 MB/s	520 MB/s	180 MB/s
Random 4K Read (IOPS max.)	79,000	79,000	95,000	45,000
Random 4K Write (IOPS max.)	73,000	73,000	91,000	20,000
MTBF (est.) @25°C	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs
P/E Cycle	3,000	20,000	30,000	60,000
TBW (max.)	1TB: 2,964 TB 512GB: 1,482TB 256GB: 741 TB 128GB: 370 TB 64GB: 185 TB 32GB: 93 TB	512GB: 9,203 TB 256GB: 4,401 TB 128GB: 2,301 TB 64GB: 1,151 TB 32GB: 560 TB 16GB: 289 TB	512GB: 13,716 TB 256GB: 6,858 TB 128GB: 3,429 TB 64GB: 1,715 TB 32GB: 834 TB	256GB: 14,819 TB 128GB: 7,409 TB 64GB: 3,705 TB 32GB: 1,852 TB 16GB: 926 TB
Operating Environment				
Operating Temperature	-40°C~85°C / -20°C~75°C	-40°C~85°C / -20°C~75°C	-40°C~85°C / -20°C~75°C	-40°C~85°C / -20°C~75°C
Storage Temperature	-55°C~95°C	-55°C~95°C	-55°C~95°C	-55°C~95°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)
Vibration	20G, 10~2000Hz	20G , 10~2000Hz	20G , 10~2000Hz	20G, 10~2000Hz
Drop	75cm	75cm	75cm	75cm
Shock	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms
Power Consumption				
Power Requirement	DC 5.0V	DC 5.0V	DC 5.0V	DC 5.0V
Power Consumption (max.)	790mA	790 mA	700 mA	295 mA
Power Idle / Standby	90mA	90 mA	110 mA	90 mA
Key Features				
Power Failure Protection (PFP)	◆	◆	◆(R)	◆
Advanced Power Shield	◆	◆	◆	◆
End-to-End Data Protection	◆	◆	◆	◆
TCG Opal 2.0			◇	
AES-256	◇	◇	◇	◇
Thermal Throttling	◆	◆	◆	◆
DEVSLP	◆	◆	◆	◆
S.M.A.R.T.	◆	◆	◆	◆
Write Protect				
Quick Erase				
Debug port				
FW Updater				
Warranty				
Warranty	3 years within TBW	5 years within TBW	5 years within TBW	5 years within TBW

*1. The read and write values may vary depending on different capacities and testing platforms.
*2. MTBF (est.) @ 25°C (MIL-HDBK-217F parts count method / Telcordia SR-332 method)
*3. ◆=Default ◇=By Request

U.2 2.5" NVMe SSD

- NGFF U.2 (SFF-8639) standard form factor
- Supports data security with AES-256 Encryption (optional)
- Compliant with NVMe Express 1.3
- Supports SP Toolbox S.M.A.R.T. health monitoring software

2.5" SATA Combo SSD

- Efficiently integrates an M.2 SATA SSD and microSD 4.0 into one 2.5" SSD interface
- Supports M.2 form factors in four different sizes (2230/2242/2260/2280)
- Supports 5 Gbps/SuperSpeed, 480 Mbps/high-speed, and 12 Mbps/full-speed transfer rates
- Flexible for expanding and adjusting storage capacity



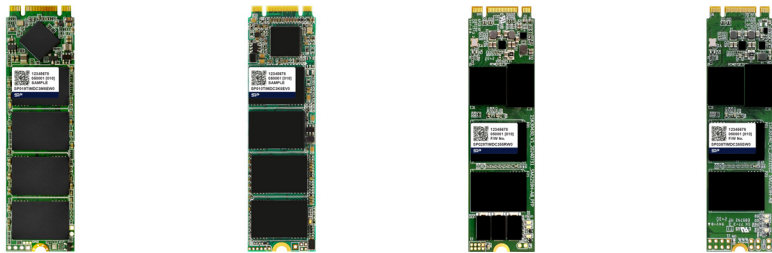
Model	SSU3F0S
Overview	
Interface	PCIe Gen3x4, NVMe 1.3
Flash Technology	3D TLC
Capacity	3.8TB~7.6TB
Form Factor	2.5 inch (7mm)
Dimensions	100.00 x 69.85 x 7.00 mm
External DRAM Buffer	Yes
Performance	
Seq. Performance Read (max.)	3,300 MB/s
Seq. Performance Write (max.)	900 MB/s
Random 4K Read (IOPS max.)	832,000
Random 4K Write (IOPS max.)	206,000
MTBF (est.) @25°C	>3,000,000 hrs
P/E Cycle	3,000
TBW (max.)	7,6TB: 12,500 TB 3,8TB: 6,000 TB
Operating Environment	
Operating Temperature	-40°C~85°C / 0°C~70°C
Storage Temperature	-55°C~95°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)
Vibration	20G, 80~2000Hz
Drop	80cm
Shock	1,500G@0.5ms
Power Consumption	
Power Requirement	DC 12V
Power Consumption (max.)	583 mA
Power Idle / Standby	191 mA
Key Features	
Power Failure Protection (PFP)	
Advanced Power Shield	◆
End-to-End Data Protection	◆
TCG Opal 2.0	◆
AES-256	◆
Thermal Throttling	◆
DEVSLP	◆
S.M.A.R.T.	◆
Write Protect	
Quick Erase	
Debug port	
FW Updater	
Warranty	
Warranty	3 years within TBW

CSD3K0E	
SATA III/6.0Gbps	
3D TLC	
64GB~2TB	
2.5 inch (7mm)	
100.4 x 69.9 x 6.8 mm	
No	
540 MB/s	
520 MB/s	
29,000	
85,000	
>3,000,000 hrs	
3,000	
2TB: 4,918 TB	
1TB: 2,459 TB	
512GB: 1,229 TB	
256GB: 614 TB	
128GB: 307 TB	
-20°C~75°C	
-55°C~95°C	
10%~95%	
(30°C Max. Wet Bulb Temp)	
20G, 10~2000Hz	
75cm	
1,500G@0.5ms	
DC 5.0V	
340 mA	
85 mA	
◆	
◆	
◆	
◆	
◆	
◆	
◆	
3 years within TBW	

*1. The read and write values may vary depending on different capacities and testing platforms.
*2. MTBF (est.) @ 25°C (MIL-HDBK-217F parts count method / Telcordia SR-332 method)
*3. ◆=Default ◇=By Request

M.2 2280 SATA SSD

- NGFF M.2 (B+M Key) standard form factor
 - Equipped with advanced PFP technology (optional)
 - Supports SP Toolbox S.M.A.R.T. health monitoring system software
- Compliant with Serial ATA Revision 3.1 standard with 6.0 Gb/s transfer rate
 - Supports data security with AES-256 Encryption (optional)



Model	MDC3M0E	MDC3K0E	MDC350R	MDC350S
Overview				
Interface	SATA III/6.0Gbps	SATA III/6.0Gbps	SATA III/6.0Gbps	SATA III/6.0Gbps
Flash Technology	3D TLC	3D TLC	3D TLC	3D TLC
Capacity	120GB~1.9TB	64GB~2TB	64GB~2TB	64GB~3.8TB
Form Factor	M.2 2280 (B+M key)	M.2 2280 (B+M key)	M.2 2280 (B+M key)	M.2 2280 (B+M key)
Dimensions	80.0 x 22.0 x 3.5 mm	80.0 x 22.0 x 3.5 mm	80.0 x 22.0 x 3.5 mm	80.0 x 22.0 x 3.5 mm
External DRAM Buffer	No	No	Yes	Yes
Performance				
Seq. Performance Read (max.)	560 MB/s	540 MB/s	560 MB/s	560 MB/s
Seq. Performance Write (max.)	500 MB/s	515 MB/s	515 MB/s	515 MB/s
Random 4K Read (IOPS max.)	55,000	49,000	92,000	92,000
Random 4K Write (IOPS max.)	65,000	70,000	81,000	81,000
MTBF (est.) @25°C	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs
P/E Cycle	3,000	3,000	3,000	3,000
TBW (max.)	1,920TB: 3,795TB 960GB: 1,382TB 480GB: 691TB 240GB: 346TB 120GB: 173TB	2TB: 4,419TB 1TB: 2,209TB 512GB: 1,105TB 256GB: 551TB 128GB: 276TB 64GB: 139TB	2TB: 5,486 TB 1TB: 2,743 TB 512GB: 1,372 TB 256GB: 686 TB 128GB: 343 TB 64GB: 176 TB	3.8TB: 10,287 TB 2TB: 5,486 TB 1TB: 2,743 TB 512GB: 1,372 TB 256GB: 686 TB 128GB: 343 TB 64GB: 176 TB
Operating Environment				
Operating Temperature	-40°C~85°C / -20°C~75°C	-20°C~75°C	-40°C~85°C	-40°C~85°C / -20°C~75°C
Storage Temperature	-55°C~95°C	-55°C~95°C	-55°C~95°C	-55°C~95°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)
Vibration	20G, 10~2000Hz	20G, 10~2000Hz	20G, 10~2000Hz	20G, 10~2000Hz
Drop	75cm	75cm	75cm	75cm
Shock	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms
Power Consumption				
Power Requirement	DC 5.0V	DC 3.3V	DC 3.3V	DC 3.3V
Power Consumption (max.)	320 mA	330 mA	750 mA	750 mA
Power Idle / Standby	140 mA	56 mA	110 mA	110 mA
Key Features				
Power Failure Protection (PFP)			◆	
Advanced Power Shield	◆	◆	◆	◆
End-to-End Data Protection			◆	◆
TCG Opal 2.0			◇	◇
AES-256	◆	◆	◇	◇
Thermal Throttling	◆	◆	◆	◆
DEVSLP	◆	◆	◆	◆
S.M.A.R.T.	◆	◆	◆	◆
Write Protect		◇		
Quick Erase		◇		
Debug port	◆	◆		
FW Updater	◆	◆		
Warranty				
Warranty	3 years within TBW	3 years within TBW	3 years within TBW	3 years within TBW
Others				
PCB placement	Single-sided	Single-sided	Double-sided	Double-sided

*1. The read and write values may vary depending on different capacities and testing platforms.

*2. MTBF (est.) @ 25°C (MIL-HDBK-217F parts count method / Telcordia SR-332 method)

*3. ◆=Default ◇=By Request

M.2 2280 SATA SSD

- NGFF M.2 (B+M Key) standard form factor
 - Equipped with advanced PFP technology (optional)
 - Supports SP Toolbox S.M.A.R.T. health monitoring system software
- Compliant with Serial ATA Revision 3.1 standard with 6.0 Gb/s transfer rate
 - Supports data security with AES-256 Encryption (optional)



Model	MDC300R	MDC300S	MDC500R	MDC500S
Overview				
Interface	SATA III/6.0Gbps	SATA III/6.0Gbps	SATA III/6.0Gbps	SATA III/6.0Gbps
Flash Technology	MLC	MLC	pSLC (MLC)	pSLC (MLC)
Capacity	32GB~1TB	32GB~1TB	16GB~512GB	16GB~512GB
Form Factor	M.2 2280 (B+M key)	M.2 2280 (B+M key)	M.2 2280 (B+M key)	M.2 2280 (B+M key)
Dimensions	80.0 x 22.0 x 3.5 mm	80.0 x 22.0 x 3.5 mm	80.0 x 22.0 x 3.5 mm	80.0 x 22.0 x 3.5 mm
External DRAM Buffer	Yes	Yes	Yes	Yes
Performance				
Seq. Performance Read (max.)	560 MB/s	560 MB/s	560 MB/s	560 MB/s
Seq. Performance Write (max.)	400 MB/s	400 MB/s	520 MB/s	520 MB/s
Random 4K Read (IOPS max.)	74,000	74,000	89,000	89,000
Random 4K Write (IOPS max.)	79,000	79,000	88,000	88,000
MTBF (est.) @25°C	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs
P/E Cycle	3,000	3,000	20,000	20,000
TBW (max.)	1TB: 2,761 TB 512GB: 1,380TB 256GB: 690 TB 128GB: 345 TB 64GB: 173 TB 32GB: 84 TB	1TB: 2,761 TB 512GB: 1,380TB 256GB: 690 TB 128GB: 345 TB 64GB: 173 TB 32GB: 84 TB	512GB: 9,203 TB 256GB: 4,601 TB 128GB: 2,301 TB 64GB: 1,151 TB 32GB: 560 TB 16GB: 289 TB	512GB: 9,203 TB 256GB: 4,401 TB 128GB: 2,301 TB 64GB: 1,151 TB 32GB: 560 TB 16GB: 289 TB
Operating Environment				
Operating Temperature	-40°C~85°C	-40°C~85°C	-40°C~85°C	-40°C~85°C
Storage Temperature	-55°C~95°C	-55°C~95°C	-55°C~95°C	-55°C~95°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)
Vibration	20G, 10~2000Hz	20G, 10~2000Hz	20G, 10~2000Hz	20G, 10~2000Hz
Drop	75cm	75cm	75cm	75cm
Shock	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms
Power Consumption				
Power Requirement	DC 5.0V	DC 5.0V	DC 5.0V	DC 5.0V
Power Consumption (max.)	790 mA	790 mA	790 mA	790 mA
Power Idle / Standby	90 mA	90 mA	90 mA	90 mA
Key Features				
Power Failure Protection (PFP)	◆	◆	◆	
Advanced Power Shield	◆	◆	◆	◆
End-to-End Data Protection	◆	◆	◆	◆
TCG Opal 2.0				
AES-256	◇	◇	◇	◇
Thermal Throttling	◆	◆	◆	◆
DEVSLP	◆	◆	◆	◆
S.M.A.R.T.	◆	◆	◆	◆
Write Protect				
Quick Erase				
Debug port				
FW Updater				
Warranty				
Warranty	3 years within TBW	3 years within TBW	5 years within TBW	5 years within TBW
Others				
PCB placement	Double-sided	Double-sided	Double-sided	Double-sided

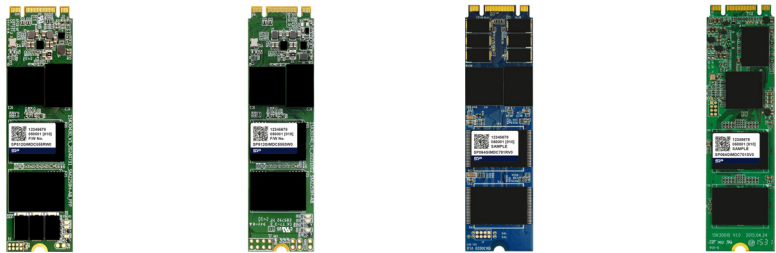
*1. The read and write values may vary depending on different capacities and testing platforms.

*2. MTBF (est.) @ 25°C (MIL-HDBK-217F parts count method / Telcordia SR-332 method)

*3. ◆=Default ◇=By Request

M.2 2280 SATA SSD

- NGFF M.2 (B+M Key) standard form factor
 - Equipped with advanced PFP technology (optional)
 - Supports SP Toolbox S.M.A.R.T. health monitoring system software
- Compliant with Serial ATA Revision 3.1 standard with 6.0 Gb/s transfer rate
 - Supports data security with AES-256 Encryption (optional)



Model	MDC550R	MDC550S	MDC700R	MDC700S
Overview				
Interface	SATA III/6.0Gbps	SATA III/6.0Gbps	SATA III/6.0Gbps	SATA III/6.0Gbps
Flash Technology	pSLC (3D TLC)	pSLC (3D TLC)	SLC	SLC
Capacity	32GB~512GB	32GB~512GB	8GB~64GB	8GB~64GB
Form Factor	M.2 2280 (B+M key)	M.2 2280 (B+M key)	M.2 2280 (B+M key)	M.2 2280 (B+M key)
Dimensions	80.0 x 22.0 x 3.5 mm	80.0 x 22.0 x 3.5 mm	80.0 x 22.0 x 3.5 mm	80.0 x 22.0 x 3.5 mm
External DRAM Buffer	Yes	Yes	Yes	Yes
Performance				
Seq. Performance Read (max.)	560 MB/s	560 MB/s	175 MB/s	175 MB/s
Seq. Performance Write (max.)	520 MB/s	520 MB/s	165 MB/s	165 MB/s
Random 4K Read (IOPS max.)	94,000	94,000	45,000	45,000
Random 4K Write (IOPS max.)	89,000	89,000	20,000	20,000
MTBF (est.) @25°C	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs
P/E Cycle	30,000	30,000	60,000	60,000
TBW (max.)	512GB: 13,716TB 256GB: 6,858TB 128GB: 3,429TB 64GB: 1,715TB 32GB: 834 TB	512GB: 13,716TB 256GB: 6,858TB 128GB: 3,429TB 64GB: 1,715TB 32GB: 834 TB	64GB: 1,388 TB 32GB: 694 TB 16GB: 347 TB 8GB: 173 TB	64GB: 1,388 TB 32GB: 694 TB 16GB: 347 TB 8GB: 173 TB
Operating Environment				
Operating Temperature	-40°C~85°C	-40°C~85°C / -20°C~75°C	-40°C~85°C	-40°C~85°C / -20°C~75°C
Storage Temperature	-55°C~95°C	-55°C~95°C	-55°C~95°C	-55°C~95°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)
Vibration	20G, 10~2000Hz	20G, 10~2000Hz	15G, 10~2000Hz	15G, 10~2000Hz
Drop	75cm	75cm	75cm	75cm
Shock	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms
Power Consumption				
Power Requirement	DC 3.3V	DC 3.3V	DC 3.3V	DC 3.3V
Power Consumption (max.)	750 mA	750 mA	500 mA	500 mA
Power Idle / Standby	110 mA	110 mA	95 mA	95 mA
Key Features				
Power Failure Protection (PFP)	◆		◆	
Advanced Power Shield	◆	◆	◆	◆
End-to-End Data Protection	◆	◆		
TCG Opal 2.0	◇	◇		
AES-256	◇	◇	◆	◆
Thermal Throttling	◆	◆		
DEVSLP	◆	◆	◆	◆
S.M.A.R.T.	◆	◆	◆	◆
Write Protect				
Quick Erase				
Debug port				
FW Updater				
Warranty				
Warranty	5 years within TBW	5 years within TBW	5 years within TBW	5 years within TBW
Others				
PCB placement	Double-sided	Double-sided	Double-sided	Double-sided

*1. The read and write values may vary depending on different capacities and testing platforms.

*2. MTBF (est.) @ 25°C (MIL-HDBK-217F parts count method / Telcordia SR-332 method)

*3. ◆=Default ◇=By Request

M.2 2260/2242 SATA SSD

- NGFF M.2 (B+M Key) standard form factor
 - Supports SP Toolbox S.M.A.R.T. health monitoring system software
- Compliant with Serial ATA Revision 3.1 standard with 6.0 Gb/s transfer rate
 - Supports data security with AES-256 Encryption (optional)



Model	MDB350S / MDB550S	MDA3K0E	MDA350S / MDA550S
Overview			
Interface	SATA III/6.0Gbps	SATA III/6.0Gbps	SATA III/6.0Gbps
Flash Technology	3D TLC / pSLC (3D TLC)	3D TLC	3D TLC / pSLC (3D TLC)
Capacity	64GB~1TB / 32GB~256GB	64GB~1TB	64GB~1TB / 32GB~256GB
Form Factor	M.2 2260 (B+M key)	M.2 2242 (B+M key)	M.2 2242 (B+M key)
Dimensions	60.0 x 22.0 x 3.5 mm	42.0 x 22.0 x 3.5 mm	42.0 x 22.0 x 3.5 mm
External DRAM Buffer	Yes	No	Yes
Performance			
Seq. Performance Read (max.)	560 MB/s / 520 MB/s	540 MB/s	520MB/s
Seq. Performance Write (max.)	520 MB/s / 400 MB/s	520 MB/s	400 MB/s
Random 4K Read (IOPS max.)	78,000 / 29,000	29,000	29,000
Random 4K Write (IOPS max.)	86,000 / 26,000	84,000	26,000
MTBF (est.) @25°C	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs
P/E Cycle	3,000 / 30,000/3,000	3,000	30,000/3,000
TBW (max.)	1TB: 3,000 TB 512GB: 1,500 TB 256GB: 750 TB 128GB: 375 TB 64GB: 187 TB 256GB: 7,499 TB 128GB: 3,750 TB 64GB: 1,875 TB 32GB: 937TB	1TB: 2,209 TB 512GB: 1,105TB 256GB: 551TB 128GB: 276TB 64GB: 139TB	1TB: 2,743 TB 512GB: 1,372 TB 256GB: 686 TB 128GB: 343 TB 64GB: 176 TB 256GB: 6,858 TB 128GB: 3,429 TB 64GB: 1,715 TB 32GB: 834 TB
Operating Environment			
Operating Temperature	-20°C~75°C	-20°C~75°C	-40°C~85°C / -20°C~75°C
Storage Temperature	-55°C~95°C	-55°C~95°C	-55°C~95°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)
Vibration	20G, 10~2000Hz	20G, 10~2000Hz	20G, 10~2000Hz
Drop	75cm	75cm	75cm
Shock	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms
Power Consumption			
Power Requirement	DC 3.3V	DC 3.3V	DC 3.3V
Power Consumption (max.)	580 mA / 520 mA	460 mA	520 mA
Power Idle / Standby	110 mA / 160 mA	< 115 mA	160 mA
Key Features			
Power Failure Protection (PFP)			
Advanced Power Shield	◆	◆	◆
End-to-End Data Protection	◆		◆
TCG Opal 2.0	◇		◇
AES-256	◇	◆	◇
Thermal Throttling	◆	◆	◆
DEVSLP	◆	◆	◆
S.M.A.R.T.	◆	◆	◆
Write Protect		◇	
Quick Erase		◇	
Debug port		◆	
FW Updater		◆	
Warranty			
Warranty	3 / 5 years within TBW	3 years within TBW	3 / 5 years within TBW
Others			
PCB placement	Double-sided	Double-sided	Double-sided

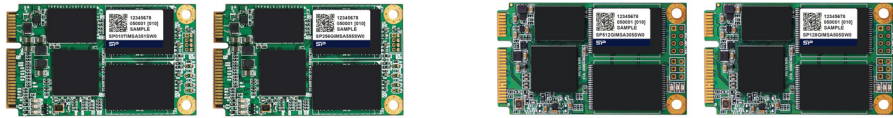
*1. The read and write values may vary depending on different capacities and testing platforms.

*2. MTBF (est.) @ 25°C (MIL-HDBK-217F parts count method / Telcordia SR-332 method)

*3. ◆=Default ◇=By Request

mSATA SSD

- MO-300A standard form factor
- Compliant with Serial ATA Revision 3.1 Standard with 6.0 Gb/s transfer rate
- Supports data security with AES-256 Encryption (optional)
- Supports SP Toolbox S.M.A.R.T. health monitoring system software

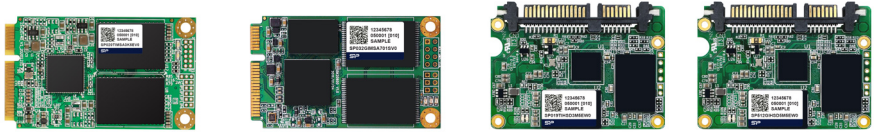


Model	MSA350S/MSA550S		MSA300S/MSA500S	
Overview				
Interface	SATA III/6.0Gbps		SATA III/6.0Gbps	
Flash Technology	3D TLC / pSLC (3D TLC)		MLC / pSLC (MLC)	
Capacity	64GB~1TB / 32GB~256GB		16GB~512GB / 16GB~256GB	
Form Factor	mSATA (MO-300)		mSATA (MO-300)	
Dimensions	51.0 x 30.0 x 3.5 mm		51.0 x 30.0 x 3.5 mm	
External DRAM Buffer	Yes		Yes	
Performance				
Seq. Performance Read (max.)	560 MB/s		560 MB/s	
Seq. Performance Write (max.)	520 MB/s		380 MB/s	
Random 4K Read (IOPS max.)	78,000 / 96,000		79,000	
Random 4K Write (IOPS max.)	60,000 / 87,000		74,000	
MTBF (est.) @25°C	>3,000,000 hrs		>3,000,000 hrs	
P/E Cycle	3,000 / 30,000		3,000 / 20,000	
TBW (max.)	1TB: 3,000 TB 512GB: 1,500 TB 256GB: 750 TB 128GB: 375 TB 64GB: 187 TB	256GB: 7,499 TB 128GB: 3,750 TB 64GB: 1,875 TB 32GB: 937 TB	512GB: 1,380 TB 256GB: 690 TB 128GB: 345 TB 64GB: 173 TB 32GB: 84 TB 16GB: 46 TB	256GB: 4,401 TB 128GB: 2,301 TB 64GB: 1,151 TB 32GB: 560 TB 16GB: 289 TB
Operating Environment				
Operating Temperature	-40°C~-85°C / -20°C~75°C		-40°C~-85°C / -20°C~75°C	
Storage Temperature	-55°C~95°C		-55°C~95°C	
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)		10%~95% (30°C Max. Wet Bulb Temp)	
Vibration	20G, 10~2000Hz		20G, 10~2000Hz	
Drop	75cm		75cm	
Shock	1,500G@0.5ms		1,500G@0.5ms	
Power Consumption				
Power Requirement	DC 3.3V		DC 3.3V	
Power Consumption (max.)	650 mA		780 mA	
Power Idle / Standby	170 mA		95 mA	
Key Features				
Power Failure Protection (PFP)				
Advanced Power Shield	◆		◆	
End-to-End Data Protection	◆		◆	
TCG Opal 2.0	◇			
AES-256	◇		◇	
Thermal Throttling	◆		◆	
DEVSLP	◆		◆	
S.M.A.R.T.	◆		◆	
Write Protect				
Quick Erase				
Debug port				
FW Updater	◆			
Warranty				
Warranty	3 / 5 years within TBW		3 / 5 years within TBW	
Others				
PCB placement	Double-sided		Double-sided	

*1. The read and write values may vary depending on different capacities and testing platforms.
*2. MTBF (est.) @ 25°C (MIL-HDBK-217F parts count method / Telcordia SR-332 method)
*3. ◆=Default ◇=By Request

mSATA SSD

- MO-300A standard form factor
- Compliant with Serial ATA Revision 3.1 Standard with 6.0 Gb/s transfer rate
- Supports data security with AES-256 Encryption (optional)
- Supports SP Toolbox S.M.A.R.T. health monitoring system software



Model	MSA3K0E	MSA700S	HSD3M0E/HSD5M0E	
Overview				
Interface	SATA III/6.0Gbps	SATA III/6.0Gbps	SATA III/6.0Gbps	
Flash Technology	3D TLC	SLC	3D TLC	
Capacity	64GB~2TB	8GB~64GB	120GB~1.9TB / 32GB~512GB	
Form Factor	mSATA (MO-300)	mSATA (MO-300)	Half Slim (MO-297)	
Dimensions	51.0 x 30.0 x 3.5 mm	51.0 x 30.0 x 3.5 mm	54.0 x 39.0 x 4.0 mm	
External DRAM Buffer	No	Yes	No	
Performance				
Seq. Performance Read (max.)	545 MB/s	175 MB/s	560 MB/s	
Seq. Performance Write (max.)	520 MB/s	165 MB/s	500 MB/s / 510 MB/s	
Random 4K Read (IOPS max.)	49,000	45,000	55,000 / 91,000	
Random 4K Write (IOPS max.)	75,000	20,000	65,000 / 81,000	
MTBF (est.) @25°C	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs	
P/E Cycle	3,000	60,000	3,000	
TBW (max.)	2TB: 4,419TB 1TB: 2,209TB 512GB: 1,105TB 256GB: 551TB 128GB: 276TB 64GB: 139TB	64GB: 1388 TB 32GB: 694 TB 16GB: 347 TB 8GB: 173 TB	1,920GB: 3,795 TB 960GB: 1,382 TB 480GB: 961 TB 240GB: 346 TB 120GB: 173 TB	512GB: 20,243 TB 256GB: 7,374 TB 128GB: 3,687 TB 64GB: 1,844 TB 32GB: 897 TB
Operating Environment				
Operating Temperature	-20°C~75°C	-40°C~85°C / -20°C~75°C	-40°C~85°C / -20°C~75°C	
Storage Temperature	-55°C~95°C	-55°C~95°C	-55°C~95°C	
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	
Vibration	20G, 10~2000Hz	20G, 10~2000Hz	20G, 10~2000Hz	
Drop	75cm	75cm	75cm	
Shock	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms	
Power Consumption				
Power Requirement	DC 3.3V	DC 3.3V	DC 5.0V	
Power Consumption (max.)	255 mA	400 mA	320 mA / 480 mA	
Power Idle / Standby	70 mA	95 mA	140 mA / 80 mA	
Key Features				
Power Failure Protection (PFP)				
Advanced Power Shield	◆	◆	◆	
End-to-End Data Protection		◆		
TCG Opal 2.0				
AES-256	◆	◇	◆	
Thermal Throttling	◆	◆	◆	
DEVSLP	◆	◆	◆	
S.M.A.R.T.	◆	◆	◆	
Write Protect	◇			
Quick Erase	◇			
Debug port	◆		◆	
FW Updater	◆		◆	
Warranty				
Warranty	3 years within TBW	5 years within TBW	3 / 5 years within TBW	
Others				
PCB placement	Double-sided	Double-sided	Double-sided	

*1. The read and write values may vary depending on different capacities and testing platforms.
*2. MTBF (est.) @ 25°C (MIL-HDBK-217F parts count method / Telcordia SR-332 method)
*3. ◆=Default ◇=By Request

FIPS 140-2

- FIPS 140-2 certified: certificate number #3758
- Supports data security with TCG OPAL & AES-256 Encryption
- Supports SP Toolbox S.M.A.R.T. health monitoring software



Model	MEC3F0F	MDC3F0F	SSD3F0F
Overview			
Interface	PCIe Gen3x4, NVMe	SATA III/6.0Gbps	SATA III/6.0Gbps
Flash Technology	3D TLC	3D TLC	3D TLC
Capacity	256GB~2TB	256GB~2TB	256GB~4TB
Form Factor	M.2 2280 (M key)	M.2 2280 (B+M key)	2.5 inch (7mm)
Dimensions	80.0 x 22.0 x 3.5 mm	80.0 x 22.0 x 3.5 mm	100.4 x 69.9 x 6.8 mm
External DRAM Buffer	No	No	No
Performance			
Seq. Performance Read (max.)	3,300 MB/s	550 MB/s	550 MB/s
Seq. Performance Write (max.)	3,000 MB/s	530 MB/s	530 MB/s
Random 4K Read (IOPS max.)	700,000	98,000	98,000
Random 4K Write (IOPS max.)	630,000	89,000	89,000
MTBF (est.) @25°C	>1,800,000 hrs	>1,800,000 hrs	>1,600,000 hrs
P/E Cycle	3,000	3,000	3,000
TBW (max.)	2TB: 3,040 TB 1TB: 1,420 TB 512GB: 650 TB 256GB: 270 TB	2TB: 3,000 TB 1TB: 1,380 TB 512GB: 640 TB 256GB: 270 TB	4TB: 6700 TB 2TB: 3,040 TB 1TB: 1,420 TB 512GB: 650 TB 256GB: 270 TB
Operating Environment			
Operating Temperature	0°C~70°C	0°C~70°C	0°C~70°C
Storage Temperature	-40°C~85°C	-40°C~85°C	-40°C~85°C
Operating Humidity	0%~90% (40°C Max. Wet Bulb Temp)	0%~90% (40°C Max. Wet Bulb Temp)	0%~90% (40°C Max. Wet Bulb Temp)
Vibration	20G p-p, 80~2000Hz	20G, 10~2000Hz	20G p-p, 80~2000Hz
Drop	80cm	80cm	80cm
Shock	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms
Power Consumption			
Power Requirement	DC 3.3V	DC 3.3V	DC 5.0V
Power Consumption (max.)	1670 mA	610 mA	460 mA
Power Idle / Standby	1790 mA	540 mA	420 mA
Key Features			
Power Failure Protection (PFP)			
Advanced Power Shield	◆	◆	◆
End-to-End Data Protection	◆	◆	◆
TCG Opal 2.0	◆	◆	◆
AES-256	◆	◆	◆
Thermal Throttling	◆	◆	◆
DEVSLP	◆	◆	◆
S.M.A.R.T.	◆	◆	◆
Write Protect			
Quick Erase			
Debug port			
FW Updater			
Warranty			
Warranty	3 years within TBW	3 years within TBW	3 years within TBW
Others			
PCB placement	Double-sided	Double-sided	

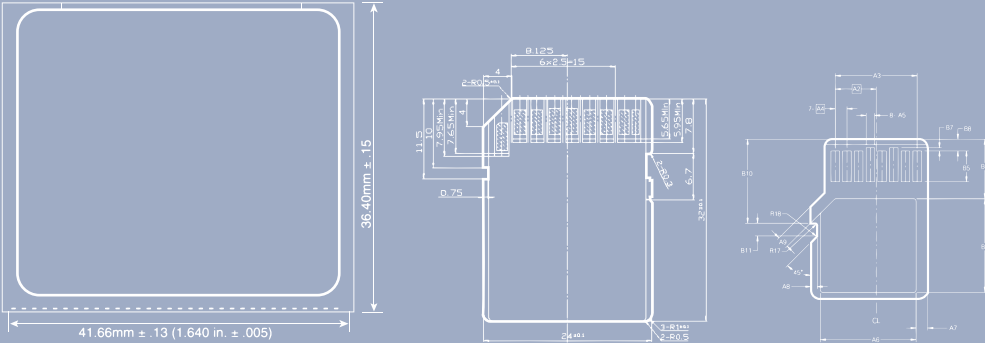
*1. The read and write values may vary depending on different capacities and testing platforms.

*2. MTBF (est.) @ 25°C (MIL-HDBK-217F parts count method / Telcordia SR-332 method)

*3. ◆=Default ◇=By Request



INDUSTRIAL Flash Card



microSD Express Card

- Compliant to microSD Memory Card Specification 7.0
- Read/Write speed up to: 800/700 (MB/s)
- Extended temperature available
- Enhanced Data reliability with LDPC ECC Protection
- SP SMART Toolbox

microSD Card

- Compliant with the SD 3.0 specification and backward-compatible with 2.0, 1.1, and 1.01
- High endurance suitable for 24/7 continuous video recording
- Steady performance design to ensure all frames are recorded
- Supports SP Toolbox S.M.A.R.T. health monitoring system software (optional)



Model	SET320	SDT3R0	SDT330
Overview			
Interface	SD 7.0 / UHS-I	SD 3.0 / UHS-I	SD 3.0 / UHS-I
Flash Technology	TLC	3D TLC	MLC
Capacity	256GB	32GB~512GB	8GB~128GB
Form Factor	microSD Express	microSD	microSD
Dimensions (mm)	15.0 x 11.0 x 1.0	15.0 x 11.0 x 1.0	15.0 x 11.0 x 1.0
Performance			
Seq. Performance Read (max.)	830 MB/s	93 MB/s	81 MB/s
Seq. Performance Write (max.)	630 MB/s	80 MB/s	46 MB/s
MTBF (est.)	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs
P/E Cycle	3,000	3,000	3,000
Duration (cycles)	10,000	10,000	10,000
Operating Environment			
Operating Temperature	-25°C~70°C	-25°C~85°C	-40°C~85°C / -25°C~85°C
Storage Temperature	-40°C~85°C	-40°C~85°C	-40°C~85°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)
Vibration	20G, 10~2000Hz	20G, 10~2000Hz	20G, 10~ 2000Hz
Drop	150cm	150cm	150cm
Shock	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms
Torque	0.15Nm	0.15Nm	0.15Nm
Bending	10N	10N	10N
Power Consumption			
Power Requirement	DC 3.3V	DC 3.3V	DC 3.3V
Power Consumption (max.)		100 mA	191 mA
Power Consumption (idle)		300 uA	292 uA
Key Features			
S.M.A.R.T.	◆	◆	◆
WORM			◇
Thermal Throttling	◆		
Warranty			
Warranty	3 years within TBW	3 years within TBW	3 years within TBW

*1. The read and write values may vary depending on different capacities and testing platforms.

*2. ◆= Default ◇=By Request

microSD Card

- Compliant with the SD 3.0 specification and backward-compatible with 2.0, 1.1, and 1.01
- High endurance suitable for 24/7 continuous video recording
- Steady performance design to ensure all frames are recorded
- Supports SP Toolbox S.M.A.R.T. health monitoring system software (optional)



Model	SDT5R0	SDT530	SDT730
Overview			
Interface	SD 3.0 / UHS-I	SD 3.0 / UHS-I	SD 3.0 / UHS-I
Flash Technology	pSLC (3D TLC)	pSLC (MLC)	SLC
Capacity	4GB~256GB	4GB~64GB	1GB~8GB
Form Factor	microSD	microSD	microSD
Dimensions (mm)	15.0 x 11.0 x 1.0	15.0 x 11.0 x 1.0	15.0 x 11.0 x 1.0
Performance			
Seq. Performance Read (max.)	93 MB/s	81 MB/s	32 MB/s
Seq. Performance Write (max.)	80 MB/s	46 MB/s	28 MB/s
MTBF (est.)	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs
P/E Cycle	30,000	30,000	60,000
Duration (cycles)	10,000	10,000	10,000
Operating Environment			
Operating Temperature	-40°C~85°C / -25°C~85°C	-40°C~85°C / -25°C~85°C	-40°C~85°C
Storage Temperature	-40°C~85°C	-40°C~85°C	-40°C~85°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)
Vibration	20G, 10~2000Hz	20G, 10~2000Hz	20G, 10~2000Hz
Drop	150cm	150cm	150cm
Shock	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms
Torque	0.15Nm	0.15Nm	0.15Nm
Bending	10N	10N	10N
Power Consumption			
Power Requirement	DC 3.3V	DC 3.3V	DC 3.3V
Power Consumption (max.)	100 mA	191 mA	70 mA
Power Consumption (idle)	300 uA	292 uA	140 uA
Key Features			
S.M.A.R.T.	◆	◆	◆
WORM			
Warranty			
Warranty	5 years within TBW	5 years within TBW	5 years within TBW

*1. The read and write values may vary depending on different capacities and testing platforms.

*2. ◆= Default ◇=By Request

SD Card

- Compliant with the SD 3.0 specification and backward-compatible with 2.0, 1.1, and 1.01
- High endurance suitable for 24/7 continuous video recording
- Steady performance design to ensure all frames are recorded
- Supports SP Toolbox S.M.A.R.T. health monitoring system software (optional)



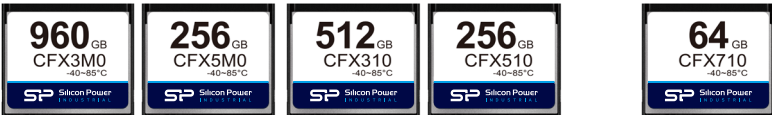
Model	SDI3R0	SDI330	SDI5R0	SDI530	SDI730
Overview					
Interface	SD 3.0 / UHS-I	SD 3.0 / UHS-I	SD 3.0 / UHS-I	SD 3.0 / UHS-I	SD 3.0 / UHS-I
Flash Technology	3D TLC	MLC	pSLC (3D TLC)	pSLC (MLC)	SLC
Capacity	32GB~256GB	8GB~128GB	4GB~64GB	4GB~64GB	1GB~8GB
Form Factor	SD Card	SD Card	SD Card	SD Card	SD Card
Dimensions (mm)	32.0 x 24.0 x 2.1	32.0 x 24.0 x 2.1	32.0 x 24.0 x 2.1	32.0 x 24.0 x 2.1	32.0 x 24.0 x 2.1
Performance					
Seq. Performance Read (max.)	93 MB/s	81 MB/s	93 MB/s	81 MB/s	40 MB/s
Seq. Performance Write (max.)	80 MB/s	46 MB/s	80 MB/s	46 MB/s	30 MB/s
MTBF (est.)	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs
P/E Cycle	3,000	3,000	30,000	30,000	60,000
Duration (cycles)	10,000	10,000	10,000	10,000	10,000
Operating Environment					
Operating Temperature	-25°C~85°C	-40°C~85°C / -25°C~85°C	-40°C~85°C / -25°C~85°C	-40°C~85°C / -25°C~85°C	-40°C~85°C
Storage Temperature	-40°C~85°C	-40°C~85°C	-40°C~85°C	-40°C~85°C	-40°C~85°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)
Vibration	20G, 10~2000Hz	20G, 10~2000Hz	20G, 10~2000Hz	20G, 10~2000Hz	30G, 10~ 2000Hz
Drop	150cm	150cm	150cm	150cm	150cm
Shock	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms
Torque	0.15Nm	0.15Nm	0.15Nm	0.15Nm	0.15Nm
Bending	10N	10N	10N	10N	10N
Power Consumption					
Power Requirement	DC 3.3V	DC 3.3V	DC 3.3V	DC 3.3V	DC 3.3V
Power Consumption (max.)	100 mA	300 mA	100 mA	100 mA	65 mA
Power Consumption (idle)	300 uA	300 uA	300 uA	300 uA	140 uA
Key Features					
Write Protect Switch	◆	◆	◆	◆	◆
S.M.A.R.T.	◆	◆	◆	◆	◆
WORM		◇			
Warranty					
Warranty	3 years within TBW	3 years within TBW	5 years within TBW	5 years within TBW	5 years within TBW

*1. The read and write values may vary depending on different capacities and testing platforms.

*2. ◆=Default ◇=By Request

CFast Card

- CFast Type I standard form factor
- Compliant with the Serial ATA Revision 3.1 Standard with 6.0 Gb/s transfer rate
- Supports SP Toolbox S.M.A.R.T. health monitoring system software (optional)



Model	CFX3M0/CFX5M0	CFX310/CFX510	CFX710
Overview			
Interface	CFast 2.0/SATA III/6.0Gbps	CFast 2.0/SATA III/6.0Gbps	CFast 2.0/SATA III/6.0Gbps
Flash Technology	3D TLC / pSLC (3D TLC)	MLC / pSLC (MLC)	SLC
Capacity	120GB~960GB / 32GB~256GB	8GB~512GB / 8GB~256GB	16GB~64GB
Form Factor	CFast	CFast	CFast
Dimensions (mm)	36.4 x 42.8 x 3.6	36.4 x 42.8 x 3.6	36.4 x 42.8 x 3.6
Performance			
Seq. Performance Read (max.)	520 MB/s / 560 MB/s	530 MB/s / 540 MB/s	440 MB/s
Seq. Performance Write (max.)	420 MB/s / 510 MB/s	330 MB/s / 450 MB/s	360 MB/s
Random 4K Read (IOPS max.)	55,000 / 91,000	32,000 / 35,000	35,000
Random 4K Write (IOPS max.)	65,000 / 81,000	32,000 / 35,000	29,000
MTBF (est.)	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs
P/E Cycle	3,000 / 60,000	3,000 / 20,000	60,000
Operating Environment			
Operating Temperature	-40°C~85°C / -20°C~75°C	-40°C~85°C / -20°C~75°C	-40°C~85°C / -20°C~75°C
Storage Temperature	-55°C~95°C	-55°C~95°C	-55°C~95°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)
Vibration	20G, 10~2000Hz	20G, 10~2000Hz	20G, 10~2000Hz
Drop	75cm	75cm	75cm
Shock	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms
Power Consumption			
Power Requirement	DC 3.3V	DC 3.3V	DC 3.3V
Power Consumption (max.)	320 mA / 480 mA	710 mA	400 mA
Power Consumption (idle)	140 mA / 80 mA	120 mA	110 mA
Key Features			
External DRAM Buffer			
Advanced Power Shield	◆	◆	◆
PFP			
DEVSLP/ TRIM	◆	◆	◆
S.M.A.R.T.	◆	◆	◆
AES-256	◆	◆	◆
Write Protect	◇	◇	◇
Quick Erase			
TCG Opal 2.0			
Thermal Throttling	◆	◆	◆
Warranty			
Warranty	3 / 5 years within TBW	3 / 5 years within TBW	5 years within TBW

*1. The read and write values may vary depending on different capacities and testing platforms.

*2. ◆=Default ◇=By Request

Compact Flash Card

- CompactFlash Type I standard form factor
- Compliant with the CompactFlash 6.0 specification (PC Card ATA protocol or True IDE mode)
- Supports PIO Mode 6, Multi-word DMA Mode 4, and Ultra Mode 7
- Supports SP Toolbox S.M.A.R.T. health monitoring system software

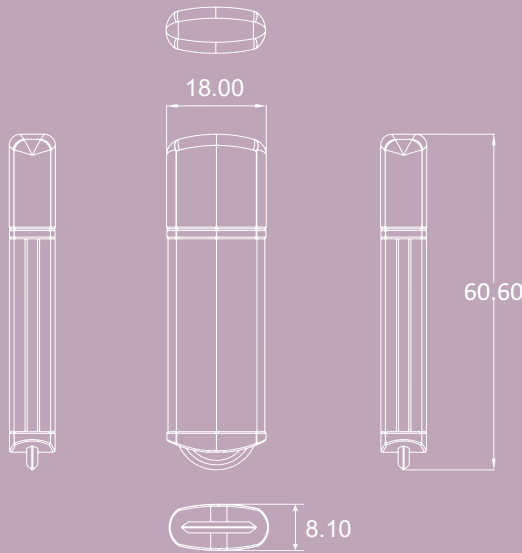


Model	CFI320	CFI520	CF-I20	CF-I30
Overview				
Interface	CF 6.0	CF 6.0	CF 4.1	CF 6.0
Flash Technology	MLC	pSLC (MLC)	SLC	SLC
Capacity	8GB~128GB	4GB~64GB	128MB~1GB	512MB~64GB
Form Factor	CF Card	CF Card	CF Card	CF Card
Dimensions (mm)	42.8 x 36.4 x 3.3	42.8 x 36.4 x 3.3	42.8 x 36.4 x 3.3	42.8 x 36.4 x 3.3
Performance				
Seq. Performance Read (max.)	115 MB/s	115 MB/s	65 MB/s	65 MB/s
Seq. Performance Write (max.)	90 MB/s	90 MB/s	54 MB/s	54 MB/s
MTBF (est.)	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs
P/E Cycle	3,000	20,000	60,000	60,000
Operating Environment				
Operating Temperature	-20°C~75°C	-20°C~75°C	-40°C~85°C / -20°C~75°C	-40°C~85°C / -20°C~75°C
Storage Temperature	-55°C~95°C	-55°C~95°C	-55°C~95°C	-55°C~95°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)	10%~95% (30°C Max. Wet Bulb Temp)
Vibration	20G, 10~2000Hz	20G, 10~2000Hz	20G, 10~2000Hz	20G, 10~2000Hz
Drop	75cm	75cm	75cm	75cm
Shock	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms
Power Consumption				
Power Requirement	DC 3.3V or DC 5.0V	DC 3.3V or DC 5.0V	DC 3.3V or DC 5.0V	DC 3.3V or DC 5.0V
Power Consumption (max.)	360 mA	360 mA	180 mA	180 mA
Power Consumption (idle)	300 mA	300 mA	200 mA	200 mA
Key Features				
Write Protect Switch			◇	◇
Power Shield	◆	◆		
S.M.A.R.T.	◆	◆	◆	◆
Warranty				
Warranty	3 years within TBW	5 years within TBW	5 years within TBW	5 years within TBW

*1. The read and write values may vary depending on different capacities and testing platforms.
*2. ◆=Default ◇=By Request



INDUSTRIAL USB



Industrial USB (USB 3.0)

- Compliant with the USB 3.0 specification and backward-compatible with USB 2.0 and USB 1.1
- Supports the USB mass storage
- Functions as a boot disk or code storage device for embedded operating systems



Model	UFD330	UFD350
Overview		
Interface	USB 3.2	USB 3.0
Flash Technology	MLC/3D TLC	3D TLC
Capacity	8GB~16GB / 32GB~256GB	32GB~256GB
Form Factor	UFB Driver	UFB Driver
Dimensions (mm)	60.6 x 18.0 x 8.1	60.6 x 18.0 x 8.1
Performance		
Seq. Performance Read (max.)	140 MB/s	240 MB/s
Seq. Performance Write (max.)	100 MB/s	80 MB/s
MTBF (est.)	>3,000,000 hrs	>3,000,000 hrs
P/E Cycle	3,000	3,000
Duration (cycles)	10,000	10,000
Operating Environment		
Operating Temperature	-20°C~75°C	-20°C~75°C
Storage Temperature	-55°C~95°C	-55°C~95°C
Operating Humidity	10%~95%	10%~95%
Vibration	20G, 10~2000Hz	20G, 10~2000Hz
Drop	75cm	75cm
Shock	1,500G@0.5ms	1,500G@0.5ms
Power Consumption		
Power Requirement	DC 5.0V	DC 5.0V
Power Consumption (max.)	200mA	200mA
Power Consumption (idle)	105mA	80mA
Key Features		
S.M.A.R.T		
Warranty		
Warranty	3 years within TBW	3 years within TBW

*1. The read and write values may vary depending on different capacities and testing platforms.

*2. ◆=Default ◇=By Request

Industrial USB (USB 2.0)

- Compliant with the USB 2.0 specification and backward-compatible with USB 1.1
- Supports the USB mass storage
- Functions as a boot disk or code storage device for embedded operating systems
- Security partition drive available by request



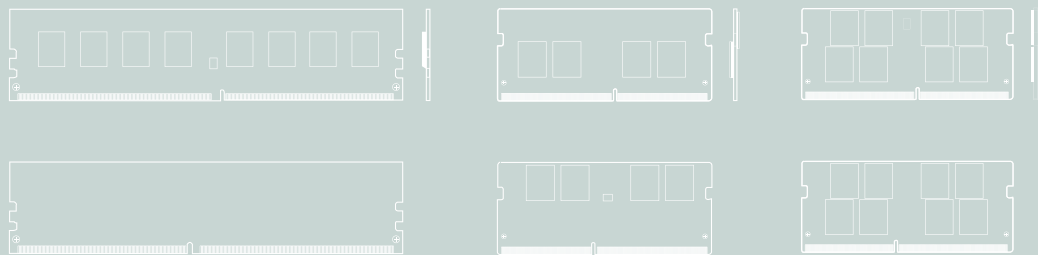
Model	UFD310	UFD510	UFD710
Overview			
Interface	USB 2.0	USB 2.0	USB 2.0
Flash Technology	MLC	pSLC (MLC)	SLC
Capacity	4GB-32GB	2GB-16GB	512MB-16GB
Form Factor	UFB Driver	UFB Driver	UFB Driver
Dimensions (mm)	60.6 x 18.0 x 8.1	60.6 x 18.0 x 8.1	60.6 x 18.0 x 8.1
Performance			
Seq. Performance Read (max.)	18 MB/s	20 MB/s	20 MB/s
Seq. Performance Write (max.)	11 MB/s	18 MB/s	18 MB/s
MTBF (est.)	>3,000,000 hrs	>3,000,000 hrs	>3,000,000 hrs
P/E Cycle	3,000	20,000	60,000
Duration (cycles)	10,000	10,000	10,000
Operating Environment			
Operating Temperature	-20°C~75°C	-20°C~75°C	-20°C~75°C
Storage Temperature	-55°C~95°C	-55°C~95°C	-55°C~95°C
Operating Humidity	10%~95%	10%~95%	10%~95%
Vibration	20G, 10~2000Hz	20G, 10~2000Hz	20G, 10~2000Hz
Drop	75cm	75cm	75cm
Shock	1,500G@0.5ms	1,500G@0.5ms	1,500G@0.5ms
Power Consumption			
Power Requirement	DC 5.0V	DC 5.0V	DC 5.0V
Power Consumption (max.)	110mA	110mA	200mA
Power Consumption (idle)	45mA	45mA	75mA
Key Features			
S.M.A.R.T			
Warranty			
Warranty	3 years within TBW	5 years within TBW	5 years within TBW

*1. The read and write values may vary depending on different capacities and testing platforms.

*2. ◆=Default ◇=By Request

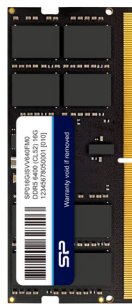


INDUSTRIAL DRAM Modules



DDR5 DRAM Modules

- Client Clock Driver (CKD)
- High performance transfer bandwidth reaches up to 51.2 GB/s
- Low voltage of 1.1V for less power consumption
- Original and high-quality memory module
- 100% tested for stability, durability, and compatibility
- 30 microinches Gold Finger Plating (optional)

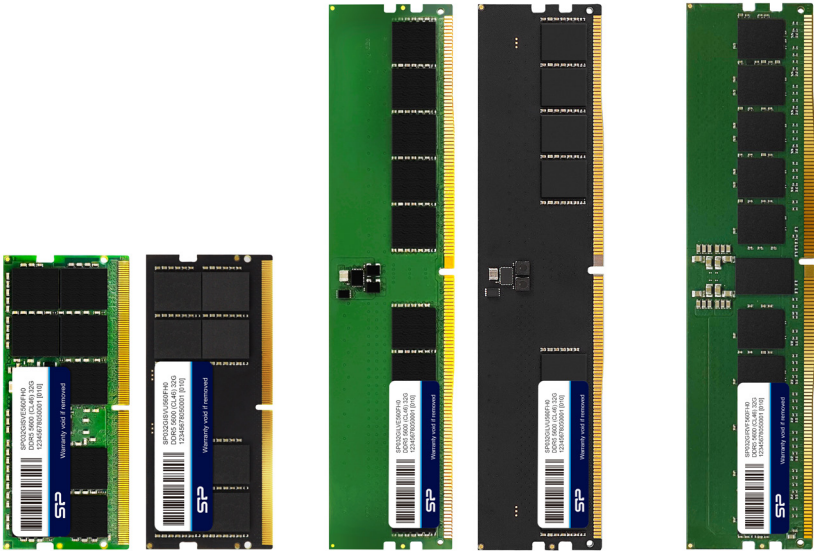


Model	CUDIMM	CSODIMM
Overview		
DRAM Type	DDR5	DDR5
Capacity	16GB	16GB
Data Rate	6400 MT/s	6400 MT/s
CAS Latency	CL52	CL52
Voltage	1.1V	1.1V
Pin Count	288pin	262pin
Data Width	64Bits	64Bits
PCB Height	1.23" (31.25mm)	1.18" (30.00mm)
Gold Finger 30 μm	◇	◇
Operating Environment		
Operating Temperature	-40°C~95°C / -20°C~95°C	-40°C~95°C / -20°C~95°C
Storage Temperature	-55°C~110°C	-55°C~110°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	
Warranty		
Warranty	Limited lifetime	

*1. ◆=Default ◇=By Request

DDR5 DRAM Modules

- High performance transfer bandwidth reaches up to 44.8GB/s
- Low voltage of 1.1V for less power consumption
- Original and high-quality memory module
- 100% tested for stability, durability, and compatibility
- 30 microinches Gold Finger Plating (optional)

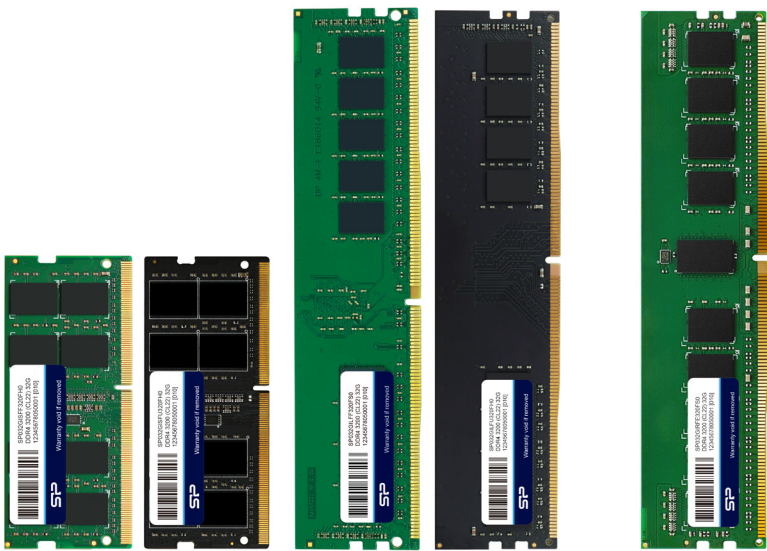


Model	ECC / SODIMM	ECC / UDIMM	RDIMM
Overview			
DRAM Type	DDR5	DDR5	DDR5
Capacity	32GB, 16GB / 48GB, 32GB, 16GB, 8GB	32GB, 16GB / 32GB, 16GB, 8GB	32GB, 16GB
Data Rate	5600 / 4800 MT/s	5600 / 4800 MT/s	5600 / 4800 MT/s
CAS Latency	CL46/CL40	CL46/CL40	CL46/CL40
Voltage	1.1V	1.1V	1.1V
Pin Count	262pin	288pin	288pin
Data Width	80Bits / 64Bits	80Bits / 64Bits	80Bits
PCB Height	1.18" (30.00mm)	1.23" (31.25mm)	1.23" (31.25mm)
Gold Finger 30 μm	◆ / ◇	◆ / ◇	◆
Operating Environment			
Operating Temperature	-40°C~-105°C / -20°C~95°C	-40°C~-105°C / -20°C~95°C	-40°C~95°C / -20°C~95°C
Storage Temperature	-55°C~110°C	-55°C~110°C	-55°C~110°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)		
Warranty			
Warranty	Limited lifetime		

*1. ◆=Default ◇=By Request

DDR4 DRAM Modules

- High performance transfer bandwidth reaches up to 19.2GB/s~25.6GB/s
- Low voltage of 1.2V for less power consumption
- Original and high-quality memory module
- 100% tested for stability, durability, and compatibility
- 30 microinches Gold Finger Plating (optional)
- Supports operating temperatures from -40°C – 105°C
- Wide Temperature version available by request
- 3200MHz is only available at 8GB ,16GB, 32GB

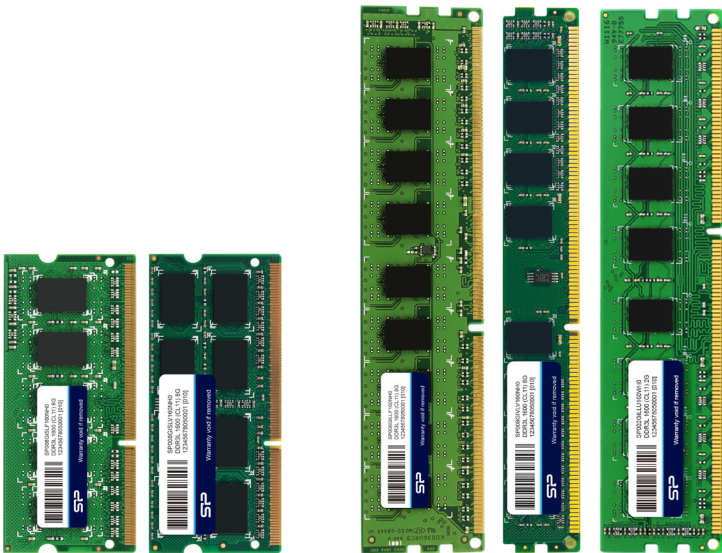


Model	ECC / SODIMM	ECC / UDIMM	RDIMM
Overview			
DRAM Type	DDR4	DDR4	DDR4
Capacity	32GB, 16GB, 8GB, 4GB, 2GB	32GB, 16GB, 8GB, 4GB, 2GB	32GB, 16GB, 8GB
Data Rate	3200/2666/2400 MT/s	3200/2666 MT/s	3200/2666 MT/s
CAS Latency	CL22/CL19/CL17	CL22/CL19	CL22/CL19
Voltage	1.2V	1.2V	1.2V
Pin Count	260pin	288pin	288pin
Data Width	72Bits / 64Bits	72Bits / 64Bits	72Bits
PCB Height	1.18" (30.00mm)	1.23" (31.25mm)	1.23" (31.25mm)
Gold Finger 30 μm	◆ / ◇	◆ / ◇	◆
Operating Environment			
Operating Temperature	-40°C~105°C / -20°C~95°C		
Storage Temperature	-55°C~110°C		
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)		
Warranty			
Warranty	Limited lifetime		

*1. ◆=Default ◇=By Request

DDR3L DRAM Modules

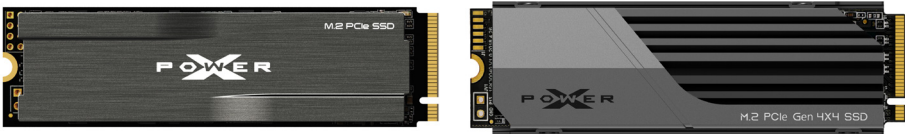
- High performance transfer bandwidth reaches up to 12.8GB/s
- Low voltage of 1.35V for less power consumption
- Original and high-quality memory module
- 100% tested for stability, durability, and compatibility
- 30 microinches Gold Finger Plating (optional)
- Supports operating temperatures from -40°C – 105°C
- Wide Temperature version available by request



Model	ECC / SODIMM	ECC / VLP / UDIMM
Overview		
DRAM Type	DDR3L	DDR3L
Capacity	8GB, 4GB, 2GB	8GB, 4GB, 2GB
Data Rate	1866 /1600 MT/s	1866 /1600 MT/s
CAS Latency	CL13/CL11	CL13/CL11
Voltage	1.35V	1.35V
Pin Count	204pin	240pin
Data Width	72Bits / 64Bits	72Bits / 64Bits / 64Bits
PCB Height	1.2" (30.15mm)	1.2" (30.50mm) / 0.74" (18.90mm) / 1.2" (30.50mm)
Operating Environment		
Operating Temperature	-40°C~105°C / -20°C~95°C	-40°C~105°C / -20°C~95°C
Storage Temperature	-55°C~110°C	-55°C~110°C
Operating Humidity	10%~95% (30°C Max. Wet Bulb Temp)	
Warranty		
Warranty	Limited lifetime	

M.2 2280 Heatsinks

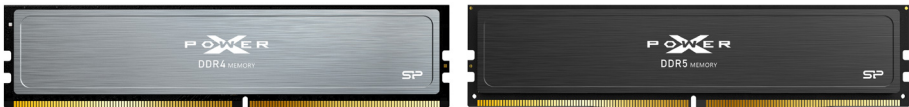
- Aluminum alloy heatsinks
- Excellent Thermal Conductivity
- High Strength-to-Weight Ratio
- Corrosion Resistance
- Machinability and Extrudability
- Optional accessories for M.2 2280



Model	HT80	HT80H
Overview		
Interface	SATA III/PCIe NVMe	SATA III/PCIe NVMe
Form Factor	M.2 2280	M.2 2280

DRAM Heatsinks

- Aluminum alloy heatsinks
- Excellent Thermal Conductivity
- High Strength-to-Weight Ratio
- Corrosion Resistance
- Machinability and Extrudability
- Optional accessories for UDIMM



Model	HTD4 (DDR4 UDIMM)	HTD5 (DDR5 UDIMM)
Overview		
DRAM Type	DDR4	DDR5