



[www.exascend.com](http://www.exascend.com)

# Product Guide 2021

Industrial, enterprise and cinematography  
storage solutions



#Administration  
#Human Resources  
#Legal  
#Marketing  
#Finance  
#Marketing  
#Publicity  
#Promotion  
#Research  
#Business  
#Development  
#Engineering  
#Manufacturing  
#Planning



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# About Exascend

Exascend is a leader in industrial and enterprise data storage specialized in fully customizable advanced storage solutions developed entirely in-house. Our passion is to develop flash storage solutions that deliver enterprise-grade performance and industrial-grade stability to the world's most demanding storage applications.

Recognizing the benefit that in-house development brings to our customers, we engineer our products from the ground up – from hardware to software – and manufacture them in-house to ensure only the highest quality. Since our founding in 2006, we have accumulated over 45 U.S. and global patents on flash storage technology, firmly establishing Exascend as a leading innovator in the storage industry.

For over a decade, our storage solutions have been qualified and deployed by Fortune 500 companies, top defense contractors and government agencies around the world. Our unique commitment to 100% in-house development of hardware and firmware, our leading validation suite, ISO 9001-certified manufacturing and quality management processes makes us the ideal partner for leaders no matter their location or industry.

Our unwavering commitment to deliver the best-engineered, most reliable and truly innovative solutions allow us to push the boundaries of what is possible for our products and our customers' applications.

*Engineering Imagination to Innovation.*

# A partner that delivers

At Exascend, we are all about making our customers and their applications excel at what they do. By leveraging our best-in-class products combined with our unique customization services, we provide a superior experience that guarantees the best results. We measure our success in how successful we make our customers. That is our commitment.

## Raise your profit margin

Deliver perfectly engineered and truly differentiated products and services by leveraging Exascend's fully optimized storage products – enabling you to put yourself ahead of the competition and avoid competing on price.

## Accelerate your time to market

Exascend is the industry's only one-stop solution provider – with design, validation and manufacturing all done in-house – reducing the time and complexity of bringing even the most thoroughly customized products to life.

## Focus on what you do best

Let us take care of your storage challenges for you, helping you save resources and mitigate the risk of uncertainty and delays.

## Stop worrying about reliability

Rest assured that your storage devices are at no risk of unexpected failure with Exascend's unwavering commitment to product quality and industry-best reliability. Our products are designed, validated and manufactured according to the highest standards, including 10,000 sudden power-loss testing cycles and fully dynamic -45–90 °C wide temperature chamber testing.

### Commodity SSD

International module houses

- “Me too” products based on third-party turnkey solutions offering inadequate customization, in-depth engineering
- Late to market with little or no differentiation dependent on competing on price to gain market share in existing markets.
- Little or no control over product quality, reliability, technical support or after-sales service.

v.s.



### Value-added SSD

Exascend

- Differentiated product with unique features, optimized for customer's operation profile, carving out uncontested market space where the customer does not need to compete on price.
- Quick turnaround time allowing the customer to seize windows of opportunity in the market, thus being able to seize market share and charge a premium on its products.
- High-quality products with unparalleled reliability, support directly from the engineering team and outstanding after-sales service.

# Customization

## Engineering Imagination to Innovation

### Hardware

- Capacity and form factor
- Interface and connector
- ESD protection
- Conformal coating
- Hardware erase and erase protocol
- Temperature sensor and thermal management
- LED configuration and polarity
- Power and performance modes
- Hardware power loss protection
- Flash and DRAM capacity (ODM)
- Auxiliary function

### Firmware

- Firmware power loss protection
- RAID ECC data protection
- Encryption (SED/TCG)
- Data erasure protocols
- Full-drive pSLC
- SLC cache mode
- Custom flash support (ODM)
- Sequential and random performance tuning
- QoS and latency tuning
- Write amplification (WAF) tuning
- Wide temperature flash tuning
- Power management tuning
- Thermal and power throttling

### Configuration and testing

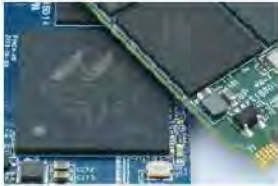
- Endurance target
- ESD, shock and vibration testing
- System compatibility and interoperability
- Overprovisioning setting
- Power consumption measurement
- Power loss testing
- Specific workload regression
- Wide temperature testing
- MP testing flow (ODM)
- Optional leaded process
- Write protect/read-only mode



# Core competency

Enterprise performance, industrial ruggedness – engineered by Exascend.

In a world of ever-accelerating data generation, Exascend empowers organizations and individuals in capturing, preserving, accessing and transforming data.



## Focused and exclusive

Exascend is the only industrial and enterprise SSD manufacturer among its peers with engineering expertise to fully utilize Marvell's premium SATA & NVMe controllers. We distinguish ourselves from the competition with our full range of Marvell-based SSDs featuring our in-house hardware and firmware designs, extreme customizability and perfect combination of enterprise-grade performance and industrial-grade ruggedness.

## Exascend customization

We offer our Marvell-based SSD products in standard form factors and entirely custom designs. In standard form factors, we offer capacities ranging from 128 GB all the way up to 8 TB. With custom designs, we go as high as 32 TB on a single SSD. We provide tailored hardware, firmware, performance, latency and QoS tuning, power and thermal throttling and much more – making our customization services second to none in the flash storage industry.



## In-house design, validation and testing

We take pride in holding our design and total solution validation and testing to the highest standards. With our ISO 9001:2015-certified manufacturing and quality management system and our over 10 years of experience delivering products to Fortune 500 companies and leading global OEMs, we are fully dedicated to ushering in a new – and much higher – quality standard for our industry. In addition to using well-known commercially available testing programs, Exascend also develops its own testing platform to continuously improve product stability, reliability and quality.

## Product quality assurance and consistency

Exascend guarantees fixed BOM for key components such as NAND flash, controller and firmware. All our SSDs are fully tested at the mass production stage for being delivered to customers. Moreover, our exclusive quality management system guarantees 100 percent transparency and traceability for all our products.



## Failure analysis and one-stop resolution service

With our full control over hardware and firmware in our solutions, we are uniquely positioned to provide customers with swift resolutions to any issues. In the event of an issue, we provide failure analysis, root cause report as well as fully resolving the issue encountered by our customer. Upon request, we can also provide an 8D report.

## Factory data recovery

An SSD's most valuable asset is not the device itself but rather the data stored within. Exascend is fully committed to safeguarding customers' data with unequalled product quality, stringent testing and advanced data security technologies such as RAID ECC. In the unlikely event that a customer's Exascend device experiences issues, whether due to a defect or an accident, we offer exclusive on-site resolution and factory data recovery service to ensure that the customer's data has the highest chances of full recovery. Our unique control over both hardware and firmware puts us in the perfect position to carry out deep-level data recovery unlike any of our peers in the industry. Our customers' data is our number-one priority. Always.



# Corporate profile

## Corporate profile

### Company overview

Founded | 2006

Established as Exascend | 2016

R&D center | Shanghai, China

Service centers | Shanghai, Shenzhen, Taipei and Sunnyvale (CA)

Manufacturing | Available in Taiwan and China

Products | SSD (SATA-III & PCIe NVMe), CFAST, CFexpress, SD card, DRAM

### Our vision and mission

#### Vision

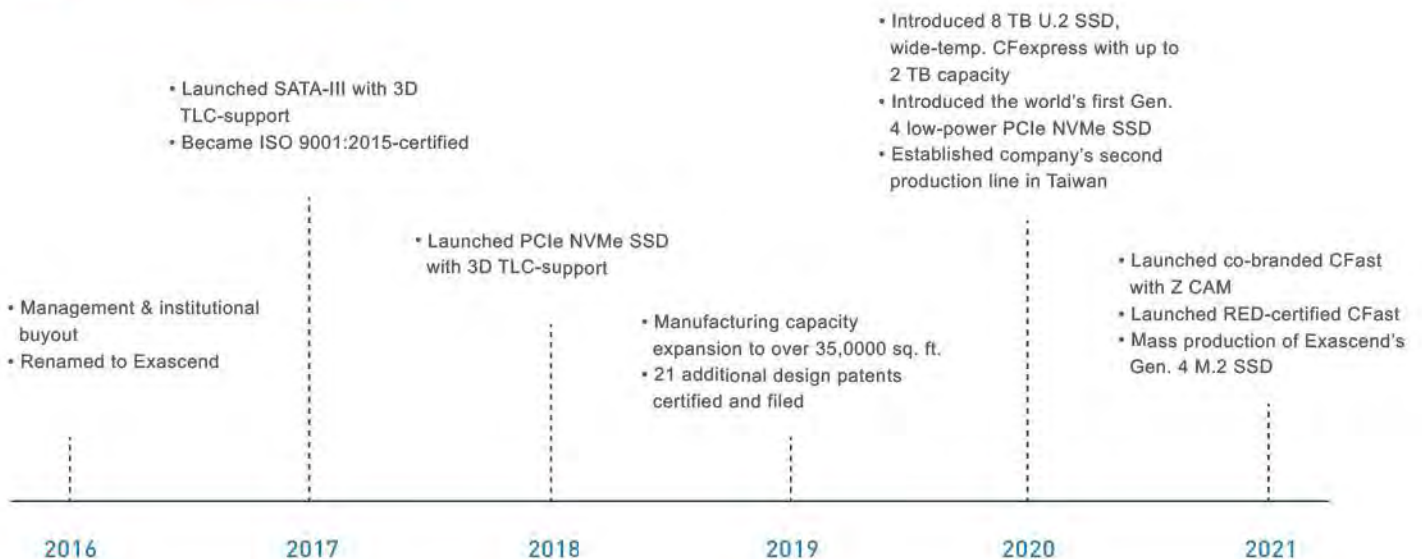
To be the most respected provider of reliable customized storage solutions across the industrial and enterprise markets.

#### Mission

To provide innovative tailored storage technology solutions that empower users to push the boundaries of what is possible.

## Engineering imagination to innovation

### Recent company highlights









# Industrial and enterprise solutions

We are passionate about storage technologies and the innovations they enable across every industry. With dependable high-performance storage, there are no limits to what innovators and industry leaders can make possible. We strive to be the storage partner that enable our customers to make our smart future possible.

Exascend's patented enterprise storage technologies are fully focused on pushing the envelope in storage performance and stability – allowing the rapid pace of enterprise data storage innovation to continue.

With our industrial technologies, we make sure that the raw performance and industry-defining innovations from enterprise storage can be deployed in even the most challenging applications – bringing the future of computing everywhere.

# Technology highlights

## Data integrity & security



### Data recovery

Your data is in safe hands with Exascend's flash storage devices. However, in the unlikely event of a user accident or a device malfunction, Exascend goes above and beyond to give your data the highest chances of full recovery. Our on-site resolution and factory data recovery services are second to none in the industry – ensuring that your data is in safe hands even if disaster strikes.

With our unique position as fully in control of hardware engineering, firmware design and manufacturing, we are uniquely qualified to carry out advanced data recovery unlike any of our peers.



### Firmware integrity plus

Firmware corruption and firmware loss are rare events that risk rendering storage devices entirely inoperable under critical operation. Firmware integrity plus is an advanced Exascend-engineered technology that keeps multiple firmware images backed up and ready to replace a faulty firmware image at a moment's notice. Firmware integrity plus provides an extra layer of protection against device malfunction perfect for equipment used in mission-critical applications.



## Customizable secure data sanitization

Rapid purging of sensitive data is a critical feature in mission-critical applications. Exascend's storage devices offer customizable secure data sanitization, including normal erasure as well as software and hardware-triggered data erasure fully compliant with federal agencies' data sanitization protocols – ensuring rapid-fast and fully secure data erasure.

### *Firmware-supported modes*

- NSA 9-12
- NSA 130-2
- AFSSI 5020
- DoD52220.22-M
- USA Army 380-19
- USA Navy NAVSO P-5239-26
- IRIG 106-7

Customized modes available upon request.

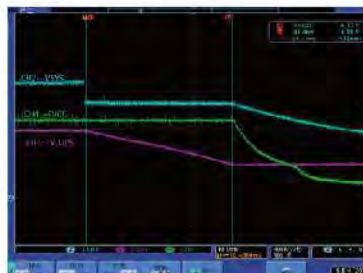
### *Hardware triggers*

Standard trigger with customized hardware triggers available upon request.



## Power loss protection

Sudden loss of power can cause severe issues in flash storage devices, putting data integrity at risk. Exascend's standard firmware power loss protection provides a first line of defense against these issues. For applications particularly sensitive to loss of power or subject to unstable power supply, Exascend's hardware-based power loss protection provides an invaluable extra line of defense against data integrity issues by leveraging tantalum capacitors that guarantee that all in-flight data is safely stored before controlled storage device shutdown.





## Tamper-proof firmware

Malicious firmware tampering is a security threat that risks compromising the very heart of the flash storage device, posing a potentially critical threat to device and system security. Exascend's tamper-proof firmware mitigates these risks with firmware encryption featuring a tamper-proof cryptographic signature, guaranteeing that any unauthorized firmware modification is rejected.

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## AES-256 encryption

Exascend's secure storage solutions offer the highest level of data protection with virtually unbreakable AES-256 encryption, guaranteeing unbeatable encryption compliant with federal agencies' stringent data security requirements.

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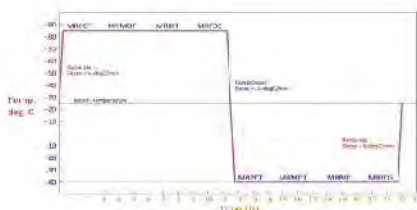
## TCG Opal 2.0

Exascend's secure storage solutions are fully compliant with TCG Opal 2.0 – a set of specifications for SEDs established by the Trusted Computing Group (TCG). Compliance with the TCG Opal 2.0 specifications protects user data from unauthorized access with features such as hardware encryption and LBA-based read/write permissions while guaranteeing industry-wide device interoperability.



## Wide temperature

Extreme-temperature environments poses a major challenge to flash storage devices, requiring high-end components and a thermally-optimized design to guarantee stable operation in the -40–85 °C (-40–185 °F) wide-temperature range. Exascend's wide temperature-optimized storage solutions use only the best components, are perfectly engineered and manufactured for demanding operation and undergo stringent validation to guarantee flawless operation in thermally challenging applications.



## Data retention plus

Advanced Exascend-developed firmware algorithm that dynamically refreshes data stored on the flash storage device based on device usage patterns. The firmware algorithm facilitates even drive wear leveling, provides protection against read, program and erase disturb – ensuring that the data stored in the NAND flash is fully reliable.

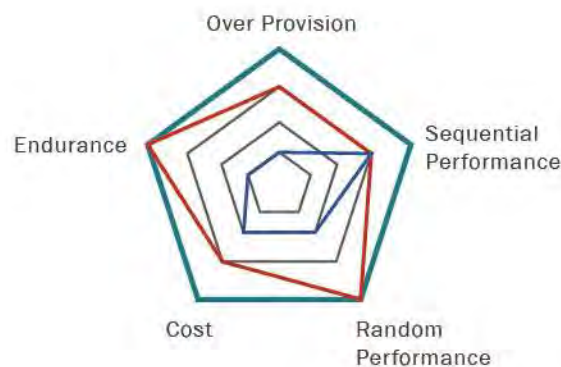
## System performance & stability

### True next-gen performance

Next-generation PCIe NVMe flash storage brings incredible performance to demanding applications and ushers in a new era where we must look beyond sequential transfer rates and random IOPS as the most important performance indicators. Exascend optimizes its flash storage devices for ultra-low latency and high Quality of Service (QoS) – going beyond a focus on raw speed to also guarantee that devices meet the ever-growing demands for low-latency and high-reliability operation in enterprise and industrial applications.

### Unlimited over-provisioning

Over-provisioning (OP) is an important technology that allows storage devices to be configured to achieve specific performance profiles suitable for specific workloads and operational requirements. With Exascend's flash storage devices, over-provisioning is completely unlocked, allowing us to meet your exact needs without being limited to the industry-standard 7% and 28% rates of over-provisioning – ensuring that your application can reach its full potential.

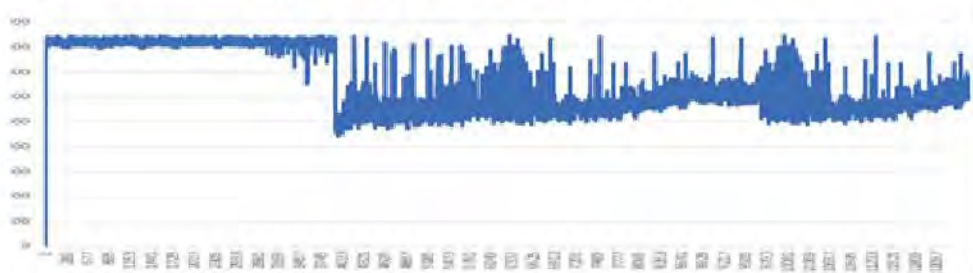




## SuperCruise

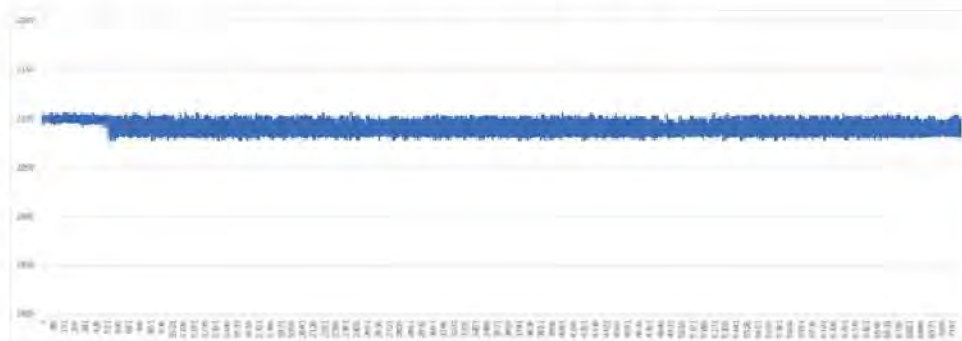
Developed by Exascend and exclusively available for Exascend's flash storage devices, SuperCruise is an extremely sophisticated firmware technology that optimizes write performance for stability over time. The SuperCruise algorithm monitors the flash storage device's ratio of free block production and consumption and adjusts read/write behavior in order to achieve consistent performance that does not fluctuate over time.

Figure 1: SSD for commercial use (sequential/random mixture)



Sequential Write in MB/s

Figure 2: SSD optimized for high-definition digital cinematography



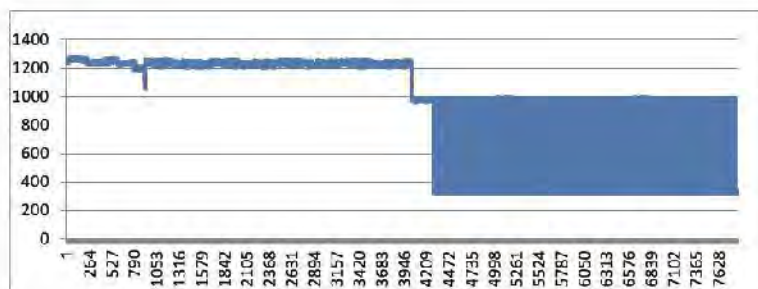
Sequential write sustained at 2,000 MB/s and 6 W power consumption



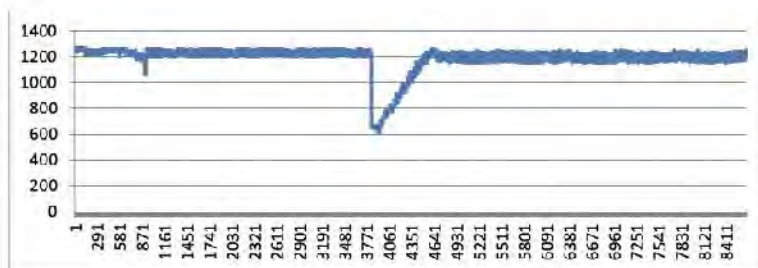


## Adaptive Thermal Control

Exascend's proprietary Adaptive Thermal Control technology tackles the issue of overheating and thermal throttling that is unavoidable in high-performance PCIe NVMe flash storage devices. Typically, flash storage devices maintain thermals under a set threshold by throttling performance – causing massive drops and spikes in performance as the devices try to keep up with changes in temperature. Exascend's Adaptive Thermal Control technology mitigates this issue by intelligently finding the perfect equilibrium point between performance and device thermals where a consistently high level of performance holds steady over time – avoiding the constant performance bursts and drops endemic with high-speed NVMe devices.



SSD write burn-in performance going from 75 °C to 85 °C with typical thermal throttling



SSD write burn-in performance going from 75 °C to 85 °C with Exascend's Adaptive Thermal Throttling



Application  
**Industrial**

Life in industrial environments is tough. Machines vibrate, spin things around and slam things in their place. Temperatures go low and rise high. Flawless industrial precision, high speed and constant production are the expectation.

Is your equipment up to the task?

## Key challenges

### Precision and performance above all

Advanced manufacturing processes rely on extreme precision and incredible performance to produce high-quality products at a staggering pace.

### Extremely costly downtime

Downtime comes at a huge cost in industrial applications, emphasizing the critical importance of device stability and reliability. Uniquely demanding

### Customized everything

Since industrial applications vary greatly in terms of environmental challenges and requirements, every solution must be customized and tuned for its specific application.

## Our solutions

### Unbeatable performance

Our flash storage devices are designed to deliver the cutting-edge sustained performance that industrial applications require.

### Unwavering stability

Our solutions put stability and reliability first – making sure that performance is stable and that modules remain operational no matter what challenges come their way.

### Truly customized solutions

Exascend's customization services are second to none with advanced in-house hardware and firmware tailoring – guaranteeing that each product is perfectly optimized for its intended application.

## Recommended product series



### PI3 series

#### Industry-optimized PCIe Gen3 SSDs

- Industrial-grade hardware ideal for industrial applications
- Wide temperature-support (-40 to 85 °C)
- Up to 8 TB capacity
- 3,200 MB/s sustained read
- 1,600 MB/s sustained write



### SI3 series

#### SATA-III made for industrial applications

- Industrial-grade hardware and wide temperature-support (-40 to 85 °C)
- 2.5", M.2 and mSATA form factors
- Up to 4 TB capacity
- Guaranteed long-term supply

**Application**  
**Mission critical**



Mission critical applications require only the best. As the name explicitly states, the mission is critical – and failure is not an option – no matter what challenges stand in its way. Even in the face of harsh conditions and unexpected variables, every component must continue operating at its best.

Are your devices ready for action?

## Key challenges

### Extreme environments and unique threats

Mission critical applications present extreme environmental challenges and unique threats to device integrity and functionality.

### Fail-safe for life

Mission success is critical, leaving no room for error or fatal device malfunctions. Top-level stability and device reliability are absolute must – as is providing maximum security.

### Customized everything

Unique form factors, unique technologies and unique features are necessary to guarantee a perfect fit and performance you can count on no matter what.

## Our solutions

### Devices engineered for maximum ruggedness

Our industrial-class storage devices are designed for extreme ruggedness at both the hardware and firmware levels, guaranteeing enterprise-level performance everywhere.

### Unparalleled stability and security

We optimize our products to deliver top-level sustained performance, delivering best-in-class stability and performance in any environment. This, combined with our security features, means that our products are always ready for action.

### Customization like no other

We provide the industry's most extensive customization services with thorough customization of both hardware and firmware always available as an option.



#### 20 TB fully customized SATA-III SSD

Example of an Exascend-designed fully customized form factor that enables an ultra-rigid storage connection in a client's mission-critical application.



**Application  
Enterprise**

How would you describe the ideal enterprise-grade SSD? Enterprise applications only settle for the best; the highest capacity, the best performance, the highest reliability, and unwavering stability. Anything else would disappoint end users and cause unnecessary additional costs down the line.

Are you due for an upgrade?

## Key challenges

### Non-stop performance

Massive workloads means that enterprise applications require sustained top performance that does not waver.

### A long-term solution

For storage devices to be economically feasible, buckling under the pressure of enterprise workloads is not an option. Long-term reliability is a must for achieving adequate cost-efficiency.

### Security you can trust

Enterprise applications that process sensitive data must be designed with security as a top priority, and their storage devices is no exception.

## Our solutions

### Storage designed for sustained performance

Our enterprise-class devices are designed to deliver the highest possible level of sustained performance, delivering all the performance that enterprise applications require.

### Impressive reliability and generous warranty

We design our storage devices to last, and our generous warranty policy reflects this commitment to long-term reliable service even in the most demanding applications.

### Value-added security features

Security is always a priority and never an afterthought in our products, and we provide customers with a wealth of optional security-enhancing features and technologies.

## Recommended product series



### PE3 series

#### Ultra-low latency PCIe Gen3 SSDs

- Enterprise-class SSDs with extreme quality of service (QoS)
- Up to 8 TB capacity
- 3,100 MB/s sustained read
- 2,000 MB/s sustained write



### SE3 series

#### Legacy SATA-III for enterprise applications

- SATA-III interface with 3D TLC NAND flash
- 2.5", M.2 and mSATA form factors
- Up to 4 TB capacity
- Guaranteed long-term supply



# Application Transportation





Transportation comes in many different shapes and forms. Yet whether it is a high-speed train, an eighteen-wheeler, an aircraft, or even a container ship, the need for rugged high-quality hardware remains the same. Vehicles face tough environments and so must all their equipment.

## Key challenges

### Massive quantities of data

Cameras and sensors generate enormous quantities of data that equipment must be able to store and process.

### Critical systems and a need for reliability

Transportation applications cannot afford to compromise on reliability as any mishap and malfunction can have disastrous effects.

### Every type of environmental challenge

Constantly varying climate conditions and a consistently tough working environment are business as usual for equipment used in the transportation sector.

## Our solutions

### High capacities and high performance

Our storage solutions are available in high-capacity configurations featuring performance ideal for tackling the transportation sector's tough requirements.

### Engineered for maximum reliability

With patented technologies and a passion for ruggedness, we make sure that all our products provide the highest level of reliability.

### Ready for action in any application

We offer a wide range of standard form factors and offer custom form factors along with advanced hardware and firmware customization, ensuring that our products are fit for fight in even the most specialized systems.

## Recommended products



### SI3 2.5" 3.84 TB

#### High-capacity industrial SATA-III SSD

- Industrial-grade hardware ideal for transportation applications
- Wide temperature-support (-40 to 85 °C)
- Legacy SATA-III interface
- Massive 3.84 TB capacity
- 3D TLC NAND flash



### PI3 M.2 3.84 TB

#### Small form factor, enormous capacity industrial SSD

- Industrial-grade hardware ideal for industrial applications
- Wide temperature-support (-40 to 85 °C)
- 4 TB capacity
- 3,100 MB/s sustained read
- 1,700 MB/s sustained write



**Application**  
**Telecommunications**

Global telecommunications is experiencing a period of rapid change with massive upgrades to wireless and wired connectivity across mobile networking, Wi-Fi and broadband underway. Faster networks and added bandwidth means new business opportunities and new innovations.

Are you positioned to capitalize on the future of telecom?

## Key challenges

### Extreme performance

The point of new telecommunications infrastructure is higher bandwidth, higher connection density, and lower latencies. And all hardware must be able to keep up.

### Tough environments

Telecommunications devices are deployed far and wide, including in environmentally-exposed infrastructure as well as in challenging industrial environments. For such applications, ample ruggedness is an absolute must.

### Cost-efficient maintenance

The scale of telecommunications infrastructure is vast, which means that maintenance needs to be kept at a minimum to make infrastructure investments economically feasible.

## Our solutions

### Telecom performance in excess

Our storage devices provide incredible performance that meet and exceed the requirements of next-generation telecommunications infrastructure.

### Tuned to tackle any challenge

With Exascend's unique customization and tuning services, we make sure that our devices provide the best possible performance in tough environments and facing any workload.

### Uniquely reliable flash storage devices

We engineer our devices to provide the highest levels of reliability, ensuring that maintenance and repairs can be kept to a minimum.

## Recommended product series



### PE3 series

#### Ultra-low latency PCIe Gen3 SSDs

- Enterprise-class SSDs with extreme quality of service (QoS)
- Up to 8 TB capacity
- 3,100 MB/s sustained read
- 2,000 MB/s sustained write



### SE3 series

#### Legacy SATA-III for demanding telecom applications

- SATA-III interface with 3D TLC NAND flash
- 2.5", M.2 and mSATA form factors
- Up to 4 TB capacity
- Guaranteed long-term supply

Application

# Edge computing



With edge computing, processing power comes closer to where it is needed the most. But the edge is challenging. Exposed to the elements and often located in places hard to reach, edge devices require efficiency, ruggedness and power.

Are your devices ready for life on the edge?

## Key challenges

### Limited space, unlimited power

Edge devices are often compact but require high-performing components to carry out their increasingly complex tasks.

### Long-term economic feasibility

Edge infrastructure is built for the long haul, requiring devices to remain fully functional with minimal downtime to be a worthwhile investment.

### Tough working environments

Often exposed to challenging outdoor conditions, tough industrial environments and remote settings, edge devices must be engineered with ruggedness as a priority.

## Our solutions

### Compact and competent

We offer exceptional performance across form factors of all sizes, including customized form factors for particularly compact or unique edge systems.

### Reliable hardware and stable performance

Our hardware is engineered to last and our firmware is designed to provide applications with a consistently high level of performance.

### Rugged to the core

Our rugged storage devices are designed from the ground up to withstand severe environmental challenges and mechanical stress – ideal for the rugged edge.

## Recommended products



### PI3 M.2 2280 3.84 TB

#### High-capacity industrial M.2 PCIe Gen3 SSD

- Industrial-grade hardware designed for the rugged edge
- Wide temperature-support (-40 to 85 °C)
- 3,200 MB/s sustained read
- 1,600 MB/s sustained write
- Massive 3.84 TB capacity
- 3D TLC NAND flash



### SI3 mSATA 1.92 TB

#### Legacy mSATA for demanding edge applications

- Industrial-grade hardware designed for the rugged edge
- Wide temperature-support (-40 to 85 °C)
- Legacy SATA-III interface
- 3D TLC NAND flash

Application

# Broadcast & cinema



High-end broadcasting and cinematography are uniquely demanding. High-resolution and high-FPS capture require massive capacities in the tiniest form factors. A single hiccup is enough to ruin a whole shoot and cause a budget overrun. Unwavering recording stability is the key.

Do you have the right professional tools at your disposal?

## Key challenges

### The need for speed

The enormous amounts of data generated by modern cameras need hardware that can process data at the same rate that it is created.

### No room for performance drops

Great top performance is impressive, but it is pointless if it cannot be sustained over time. Even the shortest moment of reduced performance causes dropped frames or worse.

### Uncompromising shooting environments

The world of professional broadcasting and cinematography puts gear to the test in the most challenging environments imaginable.

## Our solutions

### Performance to the core

Our products are designed to squeeze out every last bit of performance from their components, ensuring the best possible performance for your equipment.

### Storage that keeps up

Our hardware and firmware are carefully tuned to maintain exceptional performance even under sustained load, guaranteeing a smooth shooting experience without any frame drops.

### Industrial ruggedness everywhere

We engineer products for the toughest industrial settings imaginable and bring all that industrial-grade expertise to our broadcast and cinematography products.

## Recommended product series



NVMe SSD



CFexpress



CFast



SD



Card reader



# Cinematography solutions

Exascend is an engineering-driven leader in cinematography and photography flash storage solutions, providing products designed for true cinematography professionals. Our goal is to allow our users to reach the pinnacle of artistic expression and commercial success with storage products that allow for limitless expression.

We are combining our expertise in rugged industrial-grade SSDs and extreme-performance enterprise SSDs to craft unrivaled cinematography storage solutions that excel in sustained performance, reliability and technological prowess.

Working together with leading cinematography equipment manufacturers and some of the best people in the industry, we have created a product portfolio that brings the best out of any camera system and allows professionals to tackle even the most demanding shots.

With Exascend's storage solutions, your perfect shot is in safe hands. Every time.





**Store the world  
with Exascend**





## Tough environments

Scorching heat and freezing cold. High humidity, external shocks, and constant vibrations. Media storage needs to handle everything a challenging shot throws at them.



## Dropped frames and ruined shots

High-bitrate capture in ultra-high resolutions puts shots at high risk of suffering frame drops and other recording issues that can be extremely costly.

# Professional challenges



## Poor equipment compatibility

Different camera systems have different requirements, making it crucial to use recording media that allows you to bring the full potential out of your equipment.



## Data corruption and footage loss

Data corruption and loss is a constant risk with a myriad of potential causes including accidents, hardware damage, and electromagnetic interference.



## Industrial-grade storage

Exascend's storage products are designed for the toughest industrial applications and are hardened against environmental threats – enabling high performance and reliability anywhere.



## Engineered for sustained performance

With patented technologies and unique firmware design, Exascend's storage solutions provide extreme sustained performance that does not waver under heavy load.



## Fully tested and certified

Our storage solutions are created in partnership with leading camera system manufacturers and undergo stringent testing to certify that they deliver uncompromised performance in all equipment.



## Factory data recovery

Exascend's exclusive factory data recovery service ensures that your footage has the highest chance of full recovery in the case of an accident. Our engineering team knows the ins and outs of each product and possesses the knowledge and experience required for successful data rescue.

**Cinema-optimized  
solutions**

# Our secret recipe



## Adaptive Thermal Control

Exascend's storage products are designed for the toughest industrial applications and are hardened against environmental threats – enabling high performance and reliability anywhere.



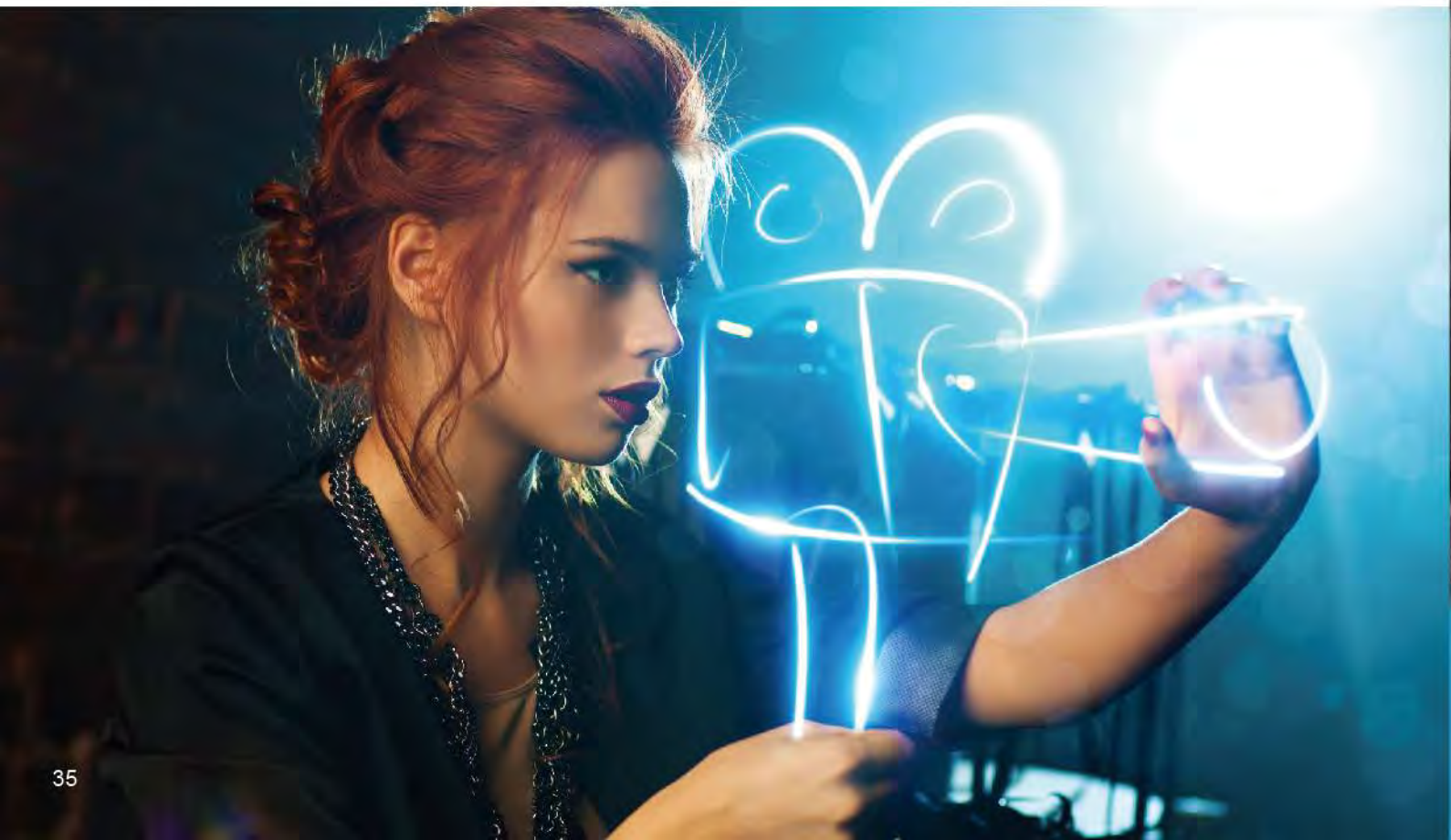
## SuperCruise

A unique firmware algorithm developed by Exascend that optimizes the ratio of free block availability and usage while prioritizing and regulating response time, thus ensuring consistent high performance without any shot-ruining stuttering or frame drops.



## Data Integrity Plus

Feature set that includes advanced technologies such as RAID ECC, automatic data refresh and end-to-end data path protection (ETEP) – guaranteeing that not a single piece of footage data gets corrupted in transit or while stored in your Exascend card.





”

**Having full confidence in that every shot is perfectly recorded and stored means complete freedom to focus on what's important.**

# CFast

Our CFast cards provide the industry's highest sustained performance, ensuring that even long shoots are perfectly recorded without any performance hiccups. Developed together with leading camera system designers and certified with all major manufacturers, you can trust Exascend's CFast cards with bringing the best out of your equipment.

				
Capacity	1 TB	512 GB	256 GB	128 GB
Max. read/write	550/530 MB/s			
Sustained read/write	550/530 MB/s			550/280 MB/s
Temperature	-5-70 °C			

# CFast reader

The perfect choice for blazing-fast footage offloading, Exascend's CFast reader ensures that you do not spend any unnecessary time waiting for files to transfer between your devices. Going from filming to post-production has never been easier.



Unlimited CFast 2.0 performance



USB 3.2 Gen 2 interface



Up to 500 MB/s transfer speed



Fully compatible with USB 2.0-3.1 & Thunderbolt 3



Device-powered with USB



Ruggedized aluminum casing and extra-rugged cables



ESD protection



Two-year limited warranty







# CFexpress

With Exascend's CFexpress cards, you get extremely high-performance storage with over 300 percent faster read and write speeds than comparable CFast cards. These cards feature Exascend's trademark sustained performance-enhancing technologies and unique hardware design with the world's fastest mass-market card type – providing ample performance to take on the pinnacle of cinematography.

				
Capacity	1 TB	512 GB	256 GB	128 GB
Max. read/write	1,700/1,700 MB/s			1,700/1,400 MB/s
Sustained read/write	1,700/1,000 MB/s	1,700/600 MB/s		1,200/300 MB/s
Temperature	-10–70 °C			

# CFexpress reader

Exascend's brand new CFexpress reader provides CFexpress users with the fastest way to get footage from the camera system into the post-production workflow – wasting no time on slow transfers.



Unlimited CFast 2.0 performance



USB 3.2 Gen 2 interface



Up to 500 MB/s transfer speed



Fully compatible with USB 2.0–3.1 & Thunderbolt 3



Device-powered with USB



Ruggedized aluminum casing and extra-rugged cables



ESD protection



Two-year limited warranty





Memory Card  
CFexpress  
Type B



EXASCEND



ESSENTIAL

AN ESSENTIAL SOLUTION FOR  
HIGH RESOLUTION 8K AND 8K  
RAW VIDEO CAPTURE



1 TB



EXASCEND

ESSENTIAL



8K



1700 MB/s  
1700 MB/s






EXASCEND

CFexpress Type B Reader

# SD card (UHS-I & UHS-II)

Exascend's brand-new SD card lineup finally delivers Exascend's trademark cinematography expertise and extreme performance in the high-speed SD (UHS-II) card format. These cards are ideal for ultra-high resolution photography and enthusiast video capture, providing the perfect balance between price and performance.

## UHS-I

			
Capacity	256 GB	128 GB	64 GB
Interface	UHS-I		
Max. read/write	180/100 MB/s		
SD card speed class	V30		
Temperature	-25-85°C		

## UHS-II

				
Capacity	256 GB	128 GB	64 GB	32 GB
Interface	UHS-II			
Max. read/write	300/260 MB/s			
SD card speed class	V90			
Temperature	-25-85°C			



# Compatible brands



## Certified compatibility\*

Camera systems where Exascend's memory cards have undergone extensive testing and been certified as fully compatible.

### CFast

Manufacturer	Model
Blackmagic Design	Pocket Cinema Camera 4K/6K
Blackmagic Design	URSA Mini Pro 12K/4.6K
Canon	EOS C200/C300 MKII/C700/ FF/1D MKII
Canon	XC10/XC15
Z CAM	E2 F6/F8/S6/M4
Hasselblad	H6D 50c/100c/400c MS
ATOMOS	Ninja Star

### CFexpress

Manufacturer	Model
Canon	Pocket Cinema Camera 4K/6K
Canon	URSA Mini Pro 12K/4.6K
Nikon	EOS C200/C300 MKII/C700/ FF/1D MKII
Nikon	XC10/XC15
Nikon	E2 F6/F8/S6/M4
Panasonic	H6D 50c/100c/400c MS

\*Exascend's memory cards work flawlessly with yet-to-be-certified systems as well.

# Co-branded products

EXASCEND + Z CAM



Z CAM-optimized CFAST 2.0 developed in collaboration with Z CAM's engineering team

EXASCEND + ARCHON



Ultra-fast CFAST cards designed exclusively for RED and fully certified by RED engineers.

# SATA-III

## Basic features

- Backwards compatible with SATA-II (3 Gb/s) and SATA-I (1.5 Gb/s)
- Supports TRIM, NCQ, DEVSLP, SMART and ATA security
- Advanced ECC and global wear-leveling algorithm
- Firmware power loss protection (PLP) for additional data protection

## Exclusive features

- RAID ECC for full data integrity
- Tamper-proof firmware with cryptographic signature
- Firmware integrity plus: ROM-based backup of multiple firmware images
- In-field firmware updates
- Data retention plus: dynamically refreshes data to strengthen data retention

## Optional features

- pSLC mode
- TCG Opal 2.0
- Hardware secure erase
- Hardware power loss protection
- Performance, power and thermal throttling
- 30 μ" gold finger for all product series
- AES-256 encryption

Product series	SC3	SC4	S12
<b>Physical information</b>			
Form factor	2.5" ; M.2 2280 ; mSATA		
Interface	SATAIII, 6.0Gbps		
Capacity	256GB~4TB	512GB~8TB	120GB~3840GB
Flash type	3D TLC		MLC
Input voltage	5V±5%; 3.3V±5%		
Power consumption	Active<5W; Idle<0.5W	Active<4.5W; Idle<0.5W	Active<5W; Idle<0.5W
<b>Performance</b>			
Maximum sequential read (MB/s)	550	550	550
Maximum sequential write (MB/s)	530	530	530
Max. 4K random read (IOPS)	98,000	98,000	98,000
Max. 4K random write (IOPS)	89,000	89,000	89,000
<b>Reliability/endurance</b>			
Operational temperature (°C)	0 - 70	0 - 70	-40 - 85
Storage temperature (°C)	-45 - 90		
UBER	1 sector per 10 <sup>17</sup> bits read		
TBW (max.)*	2,400	4,800	2,400
MTBF (hours)	2,000,000		
Warranty (years)	5	5	3
Planned schedule	MP	2022 Q2	MP

■ M.2 2280 ■ 2.5"

Product series	SC3	SC4	S12
120GB			■ ■
240GB	■ ■	■ ■	■ ■
480GB	■ ■	■ ■	■ ■
960GB	■ ■	■ ■	■ ■
1920GB	■ ■	■ ■	■ ■
3840GB	■ ■	■ ■	■
7680GB		■	

- \* TBW and DWPD are JEDEC JESD 47-compliant
- Warranty valid for the stated number or years or until the device has reached the guaranteed TBW
- DWPD stands for Drive Writes Per Day. TBW = DWPD \* capacity \* warranty \* 365/1000



# SATA-III

## Basic features

- Backwards compatible with SATA-II (3 Gb/s) and SATA-I (1.5 Gb/s)
- Supports TRIM, NCQ, DEVSLP, SMART and ATA security
- Advanced ECC and global wear-leveling algorithm
- Firmware power loss protection (PLP) for additional data protection

## Exclusive features

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- Tamper-proof firmware with cryptographic signature
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- Data retention plus: dynamically refreshes data to strengthen data retention

## Optional features

- pSLC mode
- TCG Opal 2.0
- Hardware secure erase
- Hardware power loss protection
- Performance, power and thermal throttling
- 30 μ" gold finger for all product series
- AES-256 encryption

Product series	SI3		SI4	
Sub series	Standard	pSLC	Standard	pSLC
<b>Physical information</b>				
Form factor	2.5"; M.2 (2280, 2260 & 2240); mSATA			
Interface	SATAIII, 6.0Gbps			
Capacity	240GB~3840GB	240GB~960GB	240GB~7680GB	240GB~1920GB
Flash type	3D TLC			
Input voltage	5V±5%; 3.3V±5%			
Power consumption	Active<5W; Idle<0.5W			
<b>Performance</b>				
Maximum sequential read (MB/s)	550		550	
Maximum sequential write (MB/s)	530		530	
Max. 4K random read (IOPS)	98,000		98,000	
Max. 4K random write (IOPS)	89,000		89,000	
<b>Reliability/endurance</b>				
Operational temperature (°C)	-40 - 85			
Storage temperature (°C)	-45 - 90			
UBER	1 sector per 10 <sup>17</sup> bits read			
TBW (max.)*	2,400	6,000	4,800	12,000
MTBF (hours)	2,000,000			
Warranty (years)	3	3	3	3
Planned schedule	MP	Upon Request	2022 Q1	

■ M.2 2280 ■ 2.5"

Product series	Standard	pSLC	Standard	pSLC
240GB	■ ■	■ ■	■ ■	■ ■
480GB	■ ■	■ ■	■ ■	■ ■
960GB	■ ■	■	■ ■	■ ■
1920GB	■ ■		■ ■	■
3840GB	■		■ ■	
7680GB			■	

- \* TBW and DWPD are JEDEC JESD 47-compliant
- Warranty valid for the stated number or years or until the device has reached the guaranteed TBW
- DWPD stands for Drive Writes Per Day. TBW = DWPD \* capacity \* warranty \* 365/1000

# SATA-III

## Basic features

- Backwards compatible with SATA-II (3 Gb/s) and SATA-I (1.5 Gb/s)
- Supports TRIM, NCQ, DEVSLP, SMART and ATA security
- Advanced ECC and global wear-leveling algorithm
- Firmware power loss protection (PLP) for additional data protection

## Exclusive features

- RAID ECC for full data integrity
- Tamper-proof firmware with cryptographic signature
- Firmware integrity plus: ROM-based backup of multiple firmware images
- In-field firmware updates
- Data retention plus: dynamically refreshes data to strengthen data retention
- Enterprise-grade Quality of Service (QoS): consistent low latency

## Optional features

- TCG Opal 2.0
- Hardware secure erase
- Hardware power loss protection
- Performance, power and thermal throttling
- 30 μ" gold finger for all product series
- AES-256 encryption

Product series	SE3				SE4			
	Streaming	Boot	Pro	Max	Streaming	Boot	Pro	Max
<b>Physical information</b>								
Form factor	2.5" ; M.2 2280							
Interface	SATAIII, 6.0Gbps							
Capacity	480GB~3840GB	240GB~480GB	480GB~1920GB	240GB~960GB	480GB~7680GB	240GB, 480GB	480GB~3840GB	240GB~1920GB
Flash type	3D TLC							
Input voltage	5V±5%; 3.3V±5%							
Power consumption	Active<5W; Idle<0.5W				Active<4.5W; Idle<0.5W			
<b>Performance</b>								
Maximum sequential read (MB/s)	550	550	550	550	550	550	550	550
Maximum sequential write (MB/s)	530	530	530	530	530	530	530	530
Max. 4K random read (IOPS)	98,000	98,000	98,000	98,000	98,000	98,000	98,000	98,000
Max. 4K random write (IOPS)	23,000	53,000	53,000	53,000	23,000	50,000	50,000	50,000
Latency (read/write)	120μs / 80μs							
QoS (read/write)	200μs / 300μs (@99.99)							
<b>Reliability/endurance</b>								
Operational temperature (°C)	0 - 75							
Storage temperature (°C)	-40 - 85							
UBER	1 sector per 10 <sup>17</sup> bits read							
DWPD (max.) JESD218*	0.6	1	1.5	5	0.6	1	1.5	5
MTBF (hours)	2,000,000							
Warranty (years)	5	5	5	5	5	5	5	5
Planned schedule	MP				2022 Q2			

■ M.2 2280 ■ 2.5"

Product series	Streaming	Boot	Pro	Max	Streaming	Boot	Pro	Max
240GB		■ ■		■ ■		■ ■		■ ■
480GB	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
960GB	■ ■		■ ■	■	■ ■		■ ■	■ ■
1920GB	■ ■		■		■ ■		■ ■	■
3840GB	■				■ ■		■	
7680GB					■			

\* TBW and DWPD are JEDEC JESD 47-compliant

• Warranty valid for the stated number of years or until the device has reached the guaranteed TBW

• DWPD stands for Drive Writes Per Day, TBW = DWPD \* capacity \* warranty \* 365/1000

# PCIe Gen3x4

## Basic features

- PCIe NVMe 1.2/1.3, Gen3x4
- Supports TRIM and SMART
- Advanced ECC and global wear-leveling algorithm
- Firmware power loss protection (PLP) for additional data protection

## Exclusive features

- RAID ECC for full data integrity
- Tamper-proof firmware with cryptographic signature
- Firmware integrity plus: ROM-based backup of multiple firmware images
- In-field firmware updates
- Data retention plus: dynamically refreshes data to strengthen data retention
- Enterprise-grade Quality of Service (QoS): consistently low latency

## Optional features

- TCG Opal 2.0
- Hardware secure erase
- Hardware power loss protection
- Performance, power and thermal throttling
- 30 μm gold finger for all product series
- AES-256 encryption

Product series	PI2	PC3	PC4
<b>Physical information</b>			
Form factor	M.2 2280 ; U.2		
Interface	PCIe 3.0 (NVMe 1.2)		PCIe 4.0 (NVMe 1.3)
Capacity	480GB~3840GB	512GB~8TB	512GB~4TB
Flash type	MLC	3D TLC	
Input voltage	3.3V±5% ; 12V±5%		
Power consumption	Active<8W; Idle<0.5W		Active<7W; Idle<0.5W
<b>Performance</b>			
Maximum sequential read (MB/s)	2,300	3,200	3,500
Maximum sequential write (MB/s)	2,100	2,100	3,000
Max. 4K random read (IOPS)	330,000	330,000	600,000
Max. 4K random write (IOPS)	250,000	250,000	500,000
<b>Reliability/endurance</b>			
Operational temperature (°C)	-40 - 85	0 - 70	0-70
Storage temperature (°C)	-45 - 90	-40 - 85	-40 -85
UBER	1 sector per 10 <sup>17</sup> bits read		
TBW (max.)*	2,400	4,800	2,400
MTBF (hours)	2,000,000		
Warranty (years)	3	3	3
Planned schedule	MP		2021 Q4

■ M.2 2280 ■ U.2

Product series	PI2	PC3	PC4
480GB	■ ■	■	■
960GB	■ ■	■ ■	■ ■
1920GB	■ ■	■ ■	■ ■
3840GB	■	■ ■	■
7680GB (Upon Request)		■	

- \* TBW and DWPD are JEDEC JESD 47-compliant
- Warranty valid for the stated number of years or until the device has reached the guaranteed TBW
- DWPD stands for Drive Writes Per Day. TBW = DWPD \* capacity \* warranty \* 365/1000

# PCIe Gen3x4

## Basic features

- PCIe NVMe 1.2/1.3, Gen3x4
- Supports TRIM and SMART
- Advanced ECC and global wear-leveling algorithm
- Firmware power loss protection (PLP) for additional data protection

## Exclusive features

- RAID ECC for full data integrity
- Tamper-proof firmware with cryptographic signature
- Firmware integrity plus: ROM-based backup of multiple firmware images
- In-field firmware updates
- Data retention plus: dynamically refreshes data to strengthen data retention
- Enterprise-grade Quality of Service (QoS): consistently low latency

## Optional features

- TCG Opal 2.0
- Hardware secure erase
- Hardware power loss protection
- Performance, power and thermal throttling
- 30 μm gold finger for all product series
- AES-256 encryption

Product series	PI3		PI4	
Sub-series	Standard	pSLC	Standard	pSLC
<b>Physical information</b>				
Form factor	M.2; U.2			
Interface	PCIe 3.0 (NVMe 1.2)		PCIe 4.0 (NVMe 1.3)	
Capacity	240GB~7680TB	480GB~1920GB	240GB~7680TB	480GB~1920GB
Flash type	3D TLC			
Input voltage	3.3V±5%; 12V±5%			
Power consumption	Active<8W; Idle<0.5W		Active<7W; Idle<0.3W	
<b>Performance</b>				
Maximum sequential read (MB/s)	3,200	3,200	3,500	3,500
Maximum sequential write (MB/s)	1,800	1,800	3,000	3,000
Max. 4K random read (IOPS)	330,000	330,000	600,000	600,000
Max. 4K random write (IOPS)	250,000	250,000	400,000	400,000
<b>Reliability/endurance</b>				
Operational temperature (°C)	-40 - 85			
Storage temperature (°C)	-45 - 90			
UBER	1 sector per 10 <sup>17</sup> bits read			
TBW (max.)*	4,800	12,000	4,800	12,000
MTBF (hours)	2,000,000			
Warranty (years)	3	3	3	3
Planned schedule	MP	Upon Request	2022 Q1	Upon Request

■ M.2 2280 ■ U.2

Product series	Standard	pSLC	Standard	pSLC
120GB				
240GB		■ ■		■ ■
480GB	■ ■	■ ■	■ ■	■ ■
960GB	■ ■	■	■ ■	■
1920GB	■ ■		■ ■	
3840GB	■ ■		■ ■	
7680GB	■		■	

\* TBW and DWPD are JEDEC JESD 47-compliant

• Warranty valid for the stated number of years or until the device has reached the guaranteed TBW

• DWPD stands for Drive Writes Per Day. TBW = DWPD \* capacity \* warranty \* 365/1000

# PCIe Gen3x4

## Basic features

- PCIe NVMe 1.2/1.3, Gen3x4
- Supports TRIM and SMART
- Advanced ECC and global wear-leveling algorithm
- Firmware power loss protection (PLP) for additional data protection

## Exclusive features

- RAID ECC for full data integrity
- Tamper-proof firmware with cryptographic signature
- Firmware integrity plus: ROM-based backup of multiple firmware images
- In-field firmware updates
- Data retention plus: dynamically refreshes data to strengthen data retention
- Enterprise-grade Quality of Service (QoS): consistently low latency

## Optional features

- TCG Opal 2.0
- Hardware secure erase
- Hardware power loss protection
- Performance, power and thermal throttling
- SLC cache on
- 30 μ" gold finger for all product series
- AES-256 encryption

Product series	PE3				PE4			
Sub series	Streaming	Boot	Pro	Max	Streaming	Boot	Pro	Max
<b>Physical information</b>								
Form factor	M.2; U.2				M.2; U.2			
Interface	PCIe 3.0 (NVMe 1.2)				PCIe 4.0 (NVMe 1.3)			
Capacity	480GB~7680TB	240GB, 480GB	240GB~3840GB	480GB~1920GB	480GB~7680TB	240GB, 480GB	240GB~3840GB	480GB~1920GB
Flash type	3D TLC							
Input voltage	3.3V±5%; 12V±5%							
Power consumption	Active<8W; Idle<0.5W				Active<7W; Idle<0.3W			
<b>Performance</b>								
Maximum sequential read (MB/s)	3,200	3100	3100	3100	3,500	3,500	3,500	3,500
Maximum sequential write (MB/s)	1800	600	2000	2000	3,000	650	3,000	3,000
Max. 4K random read (IOPS)	310,000	200,000	340,000	340,000	600,000	200,000	600,000	600,000
Max. 4K random write (IOPS)	37,000	15,000	50,000	65,000	80,000	37,000	100,000	150,000
Latency (read/write)	100μs / 27μs							
QoS (read/write)	160μ/200μ (@99.99)							
<b>Reliability/endurance</b>								
Operational temperature (°C)	0 - 70							
Storage temperature (°C)	-40 - 85							
UBER	1 sector per 10 <sup>17</sup> bits read							
DWPD (max.) JESD218*	0.6	1	1.5	5	0.6	1	1.5	5
MTBF (hours)	2,000,000							
Warranty (years)	5	5	5	5	5	5	5	5
Planned schedule	MP	Upon Request			MP	Upon Request		

■ M.2 2280 ■ U.2

Product series	Streaming	Boot	Pro	Max	Streaming	Boot	Pro	Max
120GB								
240GB		■ ■	■ ■	■ ■		■ ■	■ ■	■ ■
480GB	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
960GB	■ ■		■ ■	■	■ ■		■ ■	■
1920GB	■ ■		■ ■		■ ■		■ ■	
3840GB	■ ■		■		■ ■		■	
7680GB	■				■			

\* TBW and DWPD are JEDEC JESD 47-compliant

• Warranty valid for the stated number of years or until the device has reached the guaranteed TBW

• DWPD stands for Drive Writes Per Day. TBW = DWPD \* capacity \* warranty \* 365/1000

# PCIe Gen4x4

## Basic features

- PCIe NVMe 1.2/1.3, Gen3x4
- Supports TRIM and SMART
- Advanced ECC and global wear-leveling algorithm
- Hardware power loss protection (PLP) for additional data protection

## Exclusive features

- RAID ECC for full data integrity
- Tamper-proof firmware with cryptographic signature
- Firmware integrity plus: ROM-based backup of multiple firmware images
- In-field firmware updates
- Data retention plus: dynamically refreshes data to strengthen data retention
- Enterprise-grade Quality of Service (QoS): consistently low latency

## Optional features

- TCG Opal 2.0
- Hardware secure erase
- Performance, power and thermal throttling
- 30 μ" gold finger for all product series
- AES-256 encryption

Product series	PE4			
Sub series	Streaming	Boot	Pro	Max
<b>Physical information</b>				
Form factor	E1.S			
Interface	PCIe 4.0 (NVMe 1.3)			
Capacity	480GB~7680TB	240GB, 480GB	240GB~3840GB	480GB~1920GB
Flash type	3D TLC			
Input voltage	12V± 5%			
Power consumption	Active < 12W, Idle < 1W			
<b>Performance</b>				
Maximum sequential read (MB/s)	3500	3500	3500	3500
Maximum sequential write (MB/s)	3000	650	3000	3000
Max. 4K random read (IOPS)	600,000	200,000	600,000	600,000
Max. 4K random write (IOPS)	80,000	37,000	100,000	150,000
Latency (read/write)	100μs / 27μs			
QoS (read/write)	160μ/200μ (@99.99)			
<b>Reliability/endurance</b>				
Operational temperature (°C)	0 - 70			
Storage temperature (°C)	-40 - 85°			
UBER	1 sector per 10 <sup>17</sup> bits read			
DWPD (max.) JESD218*	0.6	1	1.5	5
MTBF (hours)	2,000,000			
Warranty (years)	5	5	5	5
Planned schedule	2021 Q4			

## ■ E1.S

Product series	Standard	pSLC	Standard	pSLC
960GB	■	■	■	■
1920GB	■	■	■	
3840GB	■		■	
7680GB	■			

\* TBW and DWPD are JEDEC JESD 47-compliant

• Warranty valid for the stated number of years or until the device has reached the guaranteed TBW

• DWPD stands for Drive Writes Per Day. TBW = DWPD \* capacity \* warranty \* 365/1000

# PCIe Gen4x4

## Basic features

- PCIe NVMe 1.4, Gen4x4
- Supports TRIM and SMART
- Advanced LDPC ECC and global wear-leveling algorithm
- Firmware power loss protection (PLP) for additional data protection
- AES-256 encryption

## Exclusive features

- RAID ECC for full data integrity
- Tamper-proof firmware with cryptographic signature
- Firmware integrity plus: ROM-based backup of multiple firmware images
- In-field firmware updates
- Data retention plus: dynamically refreshes data to strengthen data retention
- Enterprise-grade Quality of Service (QoS): consistently low latency

## Optional features

- pSLC mode
- TCG Opal 2.0
- Hardware secure erase
- Hardware power loss protection
- Performance, power and thermal throttling

Product series	PI5	PC5	PE5
<b>Physical information</b>			
Form factor	M.2 2280 ; U.2 ; E1.S		
Interface	PCIe Gen4 x4 (NVMe)		
Capacity	480GB~16TB		
Flash type	3D TLC / QLC		
Input voltage	5V±5%; 3.3V±5%		
Power consumption	TBD		
<b>Performance</b>			
Maximum sequential read (MB/s)	7,500		
Maximum sequential write (MB/s)	6,000		
Max. 4K random read (IOPS)	1,500,00		
Max. 4K random write (IOPS)	800,000		
Latency (read/write)	TBD		
QoS (read/write)	TBD		
<b>Reliability/endurance</b>			
Operational temperature (°C)	-40 - 85	0 - 70	
Storage temperature (°C)	-45 - 90	-40 - 85	
UBER	TBD		
TBW (max. capacity)	TBD		
DWPD (max.) JESD218*	TBD		
Warranty (years)	3	5	5
Planned schedule	Engineering Sample: Q2, 2022 ; MP Schedule: Q3, 2022		

- \* TBW and DWPD are JEDEC JESD 47-compliant
- Warranty valid for the stated number of years or until the device has reached the guaranteed TBW
- DWPD stands for Drive Writes Per Day. TBW = DWPD \* capacity \* warranty \* 365/1000

# Card storage

## Basic features

- PCIe NVMe 1.3, Gen3x2
- Advanced ECC and global wear-leveling algorithm
- Firmware power loss protection (PLP) for additional data protection

## Exclusive features

- RAID ECC for full data integrity
- Tamper-proof firmware with cryptographic signature
- Firmware integrity plus: ROM-based backup of multiple firmware images
- Data retention plus: dynamically refreshes data to strengthen data retention

## Optional features

- Performance, power and thermal throttling

Product series	CFast	CFast (I-temp)	CFexpress	CFexpress (I-temp)
<b>Physical information</b>				
Form factor	Type I		CFexpress TypeB	
Interface	SATAIII, 6.0Gbps		PCIe Gen 3 x2	
Capacity	128GB~1TB		128GB ~1TB	
Flash type	3D TLC			
Input voltage	3.3V±5%			
Power consumption	Active<5W; Idle<0.5W		Active: <3.5W ; Idle: <0.3W	
<b>Performance</b>				
Maximum sequential read (MB/s)	520	520	1,700	1,700
Maximum sequential write (MB/s)	520	520	1,700	1,700
Sustained sequential read (MB/s)	520	520	1,700	1,700
Sustained sequential write (MB/s)	520	520	1,000	1,000
Max. 4K random read (IOPS)	98,000	98,000	300,000	300,000
Max. 4K random write (IOPS)	89,000	89,000	250,000	250,000
Sustained 4K random read (IOPS)	98,000	98,000	200,000	200,000
Sustained 4K random write (IOPS)	53,000	53,000	30,000	30,000
<b>Reliability/endurance</b>				
Operational temperature (°C)	-10 - 70	-40 - 85	-20 - 70	-40 - 85
Storage temperature (°C)	-45 - 90			
UBER	1 sector per 10 <sup>17</sup> bits read			
TBW (max. capacity)	600			
MTBF (hours)	2,000,000			
Warranty (years)	5	5	5	5
Planned schedule	MP	Upon Request	MP	Upon Request

\* Warranty valid for the stated number or years or until the device has reached the guaranteed TBW

\* DWPD stands for Drive Writes Per Day; TBW = DWPD \* capacity \* warranty \* 365/1000





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