

SOLID STATE STORAGE

Secure. Reliable. Ruggedized. Fast.

WHY MEMKOR®?

Fulfilling your programs SSD requirements is Memkor's mission. Whether SATA, PCIe, PATA or SCSI interfaces; from Disk-on-Chip to custom packaging or unique form factors, Memkor has the engineering talent to make your program successful.

Loyal to Defense and Industrial Markets, Memkor offers locked Bill-of-Materials utilizing high reliability components, firmware tailoring and is committed to providing excellent customer service throughout product life cycle.

If you are looking for the best performance, our PCIe and SATA III solutions can meet the most demanding Enterprise or Client application requirements.

If you are looking for high capacity, Memkor's densely packed BLUE Series ships with up to 8TB in a 2.5" form factor and 15mm in height.

Special features that enhance user data protection and integrity, such as Write Protect, Military grade Data Elimination (Fast Erase and Purge) and Data Encryption (including TCG OPAL) are available in a number of deployable configurations.

Memkor has developed different storage families optimized for diverse applications:

- ORANGE Series with unmatched performance, capacity and resilience to hostile environments. PCIe, SATA and native PATA interfaces are supported.
- BLUE Series for special high capacity applications.
- BLACK—engineered to comply with the most extreme vibration requirements.
- WHITE Series for the legacy systems.

Latest Releases !

PCIe/NVMe SSD's

For maximum SSD performance, there is an alternative to costly SAS deployment. The PCIe interface simplifies deployment architecture by removing the SAS/SATA support chips which thus lowers hardware latency. The NVMe interface, supported now by all major OS's, eliminates software latency with the outcome being the ability to scale performance up to 200,000 IOPs and 1500 MB/s

Capacity up to 12TB

Memkor's latest generation of SATA Express SSD's breaks many storage density barriers. We can offer up to 4 TB (MLC NAND) in the 2.5"/9.5 mm high FAST Series package and up to 8 TB in the Memkor BLUE Series if a 15mm height can be supported. The new architecture allows us to scale the capacity up to 12 TB in a single SSD.

End-to-end Data Protection

The latest generation of SATA Express based ORANGE and BLUE Series SSD's provide full end-to-end data protection with strong Error Correction and Data in Transit protection. Internal to the SSD, RAID mode increases data reliability and protection beyond current ECC level.

Encryption and TCG OPAL Support

Optionally, Memkor's SATA Express FAST and BLUE Series SSD's can support self encrypted drives as defined by the TCG OPAL standard, thus offering multi level Administrative capabilities, supporting Multi-user access and user provisionable LBA ranges and attributes.



ORANGE Series SSD: PCIe, SATA, PATA

Memkor ORANGE Series consists of a broad range of SSD solutions designed as drop-in replacements for traditional mechanical SATA 1.8", 2.5" and 3.5" drives, as well as newer standards such as mSATA, NGFF (M.2 2280/22110), or non-standard SSD in Chip (SSDiC). New to the ORANGE Series this year are the 2.5" (SFF 8639) and M.2 PCIe form factors. With SATA drives saturating the SATA III bandwidth of 600MB/s, the PCIe/NVMe offers the most effective path to scale the performance up to 1,200MB/s and 200,000 IOps. The superior ruggedization of the ORANGE Series covers a wide range of deployments in portable computers, desktops, and servers. Addressing the on-going segmentation of the SSD application requirements, a number of security features, performance and power consumption options are offered.

TSG OPAL support is available on most SATA models and soon to be released support on the PCIe/NVMe models.

Memkor ORANGE Series features also include Write Protect, one of the fastest Data Elimination functions (Fast Erase and Purge) and are built to meet both Commercial and Industrial/Military environmental requirements.

Conformal coating is standard on all the Industrial/Military grade 1.8", 2.5" and 3.5" form factor models.

Memkor ORANGE Series PATA drives utilize a native PATA interface (no SATA-PATA bridge), ensuring maximum compatibility with the existing PATA systems.

SATA and/or PCIe

| | |
|---|---|
| Standard Form Factor | <ul style="list-style-type: none"> SATA: mSATA, M.2, 1.8", 2.5", 3.5" and SSDiC (FBGA) PCIe/NVMe: M.2 2280/22110 (NGFF), U.2 2.5" (SFF 8369 Connector) Contact us about 3.5" and non-standard Form Factors |
| Fast boot time and application response | <ul style="list-style-type: none"> PCIe: Up to 1000/1200 MB/s max sustained write/read rate SATA: Up to 550/550 MB/s max sustained write/read rate |
| High speed interfaces | <ul style="list-style-type: none"> Ultra DMA Mode-6; Multiword DMA Mode-2; PIO Mode-4 PCIe Gen2x2 or 4 with NVMe 1.1a |
| Capacity range | <ul style="list-style-type: none"> mSATA up to 512/256GB MLC/SLC NAND M.2 2280 (PCIe) up to 512/256GB MLC/SLC NAND M.2 2280 (SATA) up to 1024/512GB MLC/SLC NAND 1.8" up to 1024/512GB MLC/SLC NAND 2.5" up to 4096/2048GB MLC/SLC NAND |
| Operating Temperature Range | <ul style="list-style-type: none"> 0°C to 70°C Commercial -40°C to 85°C Industrial/Military |
| Operating voltage | 5V±10% (3.3V mSATA, NGFF and 1.8") |
| High Data Reliability | <ul style="list-style-type: none"> Flash managed by static and dynamic wear leveling and ECC/EDC 27+ years write endurance when overwriting disk 10 times per day (SLC) 128bit ECC; End-to-End and Data Path Protection |
| Data Integrity | HW enabled Write Protect |
| Data Security | <ul style="list-style-type: none"> Optional Data Elimination (HW triggered Fast Erase and Purge) Optional TCG OPAL 2.0, AES 256 ECB/CBC/CTR/XTS |
| Unique Flash Health monitoring | S.M.A.R.T. to report flash usage |
| High level of ruggedization | <ul style="list-style-type: none"> Humidity (non-condensing): 95% Shock: 50g, 11ms, half sine; Vibration: 16.3g (20Hz—2000Hz); operating |
| Dimensions (L x W x D) | <ul style="list-style-type: none"> mSATA - 2.01" x 1.18" x 0.15" (3.8 mm) M.2 2280 - 3.15" x 0.87" x 0.19" (4.8 mm) M.2 22110 - 4.33" x 0.87" x 0.19" (4.8 mm) 1.8" - 3.08" x 2.13" x 0.197" (5.0 mm) 2.5" - 3.92" x 2.75" x 0.37" (9.5mm) |

PATA

| | |
|------------------------------------|---|
| Standard Form Factor | 1.8", 2.5" and 3.5" |
| Fast boot and application response | 120/100 MB/s max sustained read/write rates |
| High speed interfaces | Ultra DMA Mode-6, Multiword DMA Mode-2, PIO Mode-4 |
| Capacity range | Up to 1280/640GB SLC/MLC NAND (2.5" and 3.5" FF) |
| Operating Temperature Range | <ul style="list-style-type: none"> 0°C to 70°C Commercial -40°C to 85°C Industrial/Military |
| Operating voltage | 5V±10% |
| High Data Reliability | <ul style="list-style-type: none"> Flash managed by static and dynamic wear leveling and ECC/EDC 27+ years write endurance when overwriting disk 10 times per day (SLC) |
| Data Integrity | Optional HW enabled Write Protect |
| Data Security | Data Elimination (Fast Erase and Purge) |
| Unique Flash Health monitoring | S.M.A.R.T. to report flash usage |
| High level of ruggedization | <ul style="list-style-type: none"> Humidity (non-condensing): 95% Shock: 50g, 11ms, half sine; Vibration: 16.3g (20Hz—2000Hz); operating |
| Dimensions (L x W x D) | <ul style="list-style-type: none"> 1.8" - 2.795" x 2.126" x 0.197" (5.0 mm) 2.5" - 3.92" x 2.75" x 0.37" (9.5mm); 3.5" - 5.748" x 4" x 0.583" (14.8mm) |



SFF 8639 PCIe/SATA connector



ORANGE Series: M.2 2280 PCIe/SATA 512GB MLC NAND



ORANGE Series: 2.5" PCIe/SATA 4 TB MLC NAND



ORANGE Series: 256GB mSATA



ORANGE Series: 1.8" μSATA 1TB MLC NAND



ORANGE Series: 2.5" PATA 1 TB MLC NAND

User Data Integrity

Memkor utilizes state of the art wear-leveling combined with up to 125bits/1024B strong ECC, smart cache, data shaping and other sophisticated techniques to ensure even NAND usage across the entire drive, minimized erase/program counts regardless of the application or drive capacity which results in an unparalleled user data integrity and reliability.

Data Encryption

Memkor SSD's can include on selected models the Data Encryption function, providing 256-bit AES strength, TCG OPAL Security Subsystem Class or NIST&CSE and FIPS 140-2 compliant solution. With a number of ways to support Key Management, Memkor offers deployment flexibility with the ability to tailor the implementation to the specific requirements.

Write Protect

The hardware enabled Write Protect function is optionally available on most of the models in a variety of deployment scenarios. For example Memkor 2.5" ORANGE Series SSD's Write Protect can be enabled via an external front, or back, or SATA host connector.

BLUE Series SSD: PCIe and SATA

Memkor BLUE Series SSD's are geared towards high performance data recorders requiring highest capacity per SATA port. Memkor BLUE Series SSD's can scale the capacity to 8192GB (MLC NAND) in 2.5" form factor and 0.602" (15.3mm) height for both Commercial and Defense/Industrial versions. Memkor BLUE Series provides outstanding sustained read/write performance of up to 1500/1400 MB/s and, optionally, one of the fastest Data Elimination function (Fast Erase and your choice among multiple Purge algorithms) and TCG OPAL. Conformal coating is standard on all the Defense/Industrial grade models.

SATA and/or PCIe

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|---|--|
| Standard Form Factor | <ul style="list-style-type: none"> • 2.5" with either SATA or SFF 8639 connector • Ask us about 3.5" |
| Fast boot time and application response | <ul style="list-style-type: none"> • PCIe: Up to 1000/1200 MB/s max sustained write/read rate • SATA: Up to 550/550 MB/s max sustained write/read rate |
| High speed interfaces | <ul style="list-style-type: none"> • Ultra DMA Mode-6; Multiword DMA Mode-2; PIO Mode-4 • PCIe Gen2x2 or 4 with NVMe 1.1a |
| Capacity range | <ul style="list-style-type: none"> • Up to 4096GB and 8192GB SLC and MLC NAND respectively in 0.591" H (Industrial operating temperatures) |
| Operating Temperature Range | <ul style="list-style-type: none"> • 0°C to 70°C Commercial • -40°C to 85°C Industrial/Military |
| Power Reduction | <ul style="list-style-type: none"> • DEVSLP for SATA and ASPM L0/L1/L1.1/L1.2 for PCIe |
| Operating voltage | <ul style="list-style-type: none"> • 5V±10% |
| High Data Reliability | <ul style="list-style-type: none"> • Flash managed by static and dynamic wear leveling and ECC/EDC • 27+ years write endurance when overwriting disk 10 times per day (SLC) • 128bit ECC; End-to-End and Data Path Protection |
| Data Security | <ul style="list-style-type: none"> • Optional Data Elimination (HW triggered Fast Erase and Purge) • Optional TCG OPAL 2.0, AES 256 ECB/CBC/CTR/XTS |
| Unique Flash Health monitoring | <ul style="list-style-type: none"> • S.M.A.R.T. to report flash usage |
| High level of ruggedization | <ul style="list-style-type: none"> • Humidity (non-condensing): 95% • Shock: 50g, 11ms, half sine; Vibration: 16.3g (20Hz—2000Hz); operating |
| Dimensions (L x W x D) | <ul style="list-style-type: none"> • 3.92" x 2.75" x 0.591" (15.0mm) for 4/8TB SLC/MLC NAND (Industrial) |



BLUE Series: 2.5" PCIe/SATA 8TB MLC NAND.



BLUE Series: 2.5" SATA 2TB SLC NAND Industrial

BLACK Series SSD

Memkor BLACK Series combines Memkor ORANGE and BLUE Series SSD capabilities, with the innovative mechanical design to achieve exceptional resistance to the most extreme shock and vibration levels defined in the MIL-810G standard. With a capacity ranging from 16GB to 1024GB using SLC NAND, featuring Write Protect, Data Elimination and optional highly ruggedized HiVibe SATA connector, the BLACK Series considerably expands the deployment flexibility of the Memkor family of SSD's.

SATA

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|---|---|
| Standard Form Factor | <ul style="list-style-type: none"> • 2.5" • up Ask us about 3.5" |
| Fast boot time and application response | <ul style="list-style-type: none"> • Up to 500 MB/s MB/s max sustained read rate for SATA III SSD • Up to 400 MB/s MB/s max sustained write rate for SATA III SSD |
| High speed interfaces | <ul style="list-style-type: none"> • Ultra DMA Mode-6 • Multiword DMA Mode-2 • PIO Mode-4 |
| Capacity range | <ul style="list-style-type: none"> • Up to 512/1024GB SLC NAND in 0.374" [9.5 mm]/0.511" [14.0mm] H • Ask us if you need higher capacity, or about the use of Industrial MLC NAND |
| Operating Temperature Range | <ul style="list-style-type: none"> • 0°C to 70°C Commercial • -40°C to 85°C Industrial/Military |
| Operating voltage | <ul style="list-style-type: none"> • 5V±10% |
| High Data Reliability | <ul style="list-style-type: none"> • Flash managed by static and dynamic wear leveling and ECC/EDC • 27+ years write endurance when overwriting disk 10 times per day (SLC) |
| Data Security | <ul style="list-style-type: none"> • Data Elimination (Fast Erase and Purge) |
| Unique Flash Health monitoring | <ul style="list-style-type: none"> • S.M.A.R.T. to report flash usage |
| High level of ruggedization | <ul style="list-style-type: none"> • Please contact us for more details |
| Dimensions (L x W x D) | <ul style="list-style-type: none"> • 3.92" x 2.75" x 0.374" (9.5mm) for up to 512GB SLC NAND • 3.92" x 2.75" x 0.511" (14.0mm) for 1024GB SLC NAND |



BLACK Series, 2.5" SATA 128GB, Data Elimination Extreme Ruggedization



BLACK Series, 2.5" SATA 1024GB, Data Elimination



Data Elimination

Memkor SSD's can optionally include the Data Elimination functions: FAST ERASE and PURGE. FAST ERASE eliminates the data from all physical media locations by performing a single erase. Its execution takes 2-12 seconds. PURGE eliminates both the data and the data remanence that could otherwise enable user data recovery in the lab. PURGE requires multiple erase and overwrite cycles, and in some cases includes verification, as governed by different standards. PURGE duration varies between 5-30 minutes depending upon the procedure. Software and/or hardware triggers are available. The Data Elimination removes user data and related metadata. The SSD's are reusable immediately after the procedure and are in non-initialized state.

Supported Purge Procedures

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|------|-----------------------------------|
| DoD | DoD 5220.22-M NISPOM 8-306 1995 |
| DoD | DOD 5220.22-M NISPOM Supplement 1 |
| NSA | NSA 130-2 |
| NSA | NSA 9-12 |
| Army | AR 380-19 |
| Navy | NAVSOP-5239-26 |
| AF | AFSSI-5020 |

WHITE Series SSD

Memkor WHITE Series SSD's address the requirements of traditional SCSI based applications. There are different SCSI standards and also different implementations that pose a challenge to IT managers when looking for replacement parts. Memkor has developed the expertise and is working with Customers in addressing the interoperability issues of the SCSI legacy systems. Memkor WHITE Series SCSI SSD's are optionally equipped with hardware triggered Military grade Data Elimination (Fast Erase and Purge) and Write Protect functions.

SCSI

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|-----------------------------|---|
| Standard Form Factor | 3.5" (50-pin Narrow SCSI-2; 68-pin and 80-pin Ultra-3 SCSI) |
| Performance | • 5/10/20 MB/s (SCSI-2); 170 MB/s Ultra –3 SCSI |
| Capacity range | • Up to 1024/2048GB SLC/MLC NAND |
| Temperature Range | • 0°C to 60°C operating; -20°C to 65°C storage • Ask us about other operating temperature ranges |
| High Data Reliability | • MLC or SLC NAND, strong wear leveling and ECC/EDC • 27+ years write endurance when overwriting disk 10 times per day (SLC) |
| High level of ruggedization | • Shock: 50g, 11ms, half sine; Vibration: 16.3g; Humidity (N-C): 95% |
| Dimensions (L x W x D) | • 5.77" x 4" x 1.02" for 3.5" |



3.5" 50-pin, 8GB, SCSI SSD

SATA Connector Ruggedized to Perfection: HiVibe^(c)

Standard SATA connector is typically rated for 6gRMS vibration level and 200-600 insertion cycles. The traditional approach to address these limitations requires development effort and result in extra-hardware. Memkor, in collaboration with Amphenol Aerospace, introduces a solution—HiVibe. Built on Micro-Hyperboloid technology, HiVibe is rated for more than 30Grms and 20,000 insertion cycles. To facilitate HiVibe deployment and minimize the cost, computer board mating right-angle or vertical receptacles fit in the mounting footprint of the equivalent standard SATA connectors.

HiVibe is available as an option on any Memkor 2.5" SATA SSD.



Micro-Hyperboloid and Straddle and Cable HiVibe SATA Connectors

General Product Guide

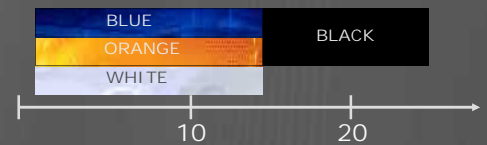
Performance [MB/s]



Capacity [GB]



Ruggedization Vibration [g's RMS]



A few of our Latest Releases

| | | | | | |
|--------|----------|-----------------|-----------|---------------|-----------------------------------|
| 4TB | MLC NAND | 2.5"/9.5mm H | SATA III | ORANGE Series | Secure Erase, Write Protect, OPAL |
| 4TB | MLC NAND | 2.5"/PCIe cards | PCIe/NVMe | ORANGE Series | Secure Erase, Write Protect, OPAL |
| 512GB | MLC NAND | M.2 2280 | PCIe/NVMe | ORANGE Series | Secure Erase, Write Protect, OPAL |
| 1024GB | MLC NAND | M.2 22110 | PCIe/NVMe | ORANGE Series | Secure Erase, Write Protect, OPAL |
| 4TB | SLC NAND | 2.5"/15mm H | SATA III | BLUE Series | Secure Erase, Write Protect, OPAL |
| 8TB | MLC NAND | 2.5"/15mm H | PCIe/NVMe | ORANGE Series | Secure Erase, Write Protect, OPAL |

About Memkor

Memkor® is an American engineering company dedicated to providing flash solid state storage solutions for defense, industrial and enterprise applications. We create secure, reliable, robust and innovative solutions with rich feature sets, tailored, as required, to meet your technology investment objectives. We are dedicated to delivering on our promises. We simply believe that your satisfaction enables the continuous success of our company.

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