Innodisk's Embedded Flash and DRAM Storage For Aerospace and Defense Applications

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The Aerospace and Defense Industries: Unique Challenges

The aerospace and defense industries are capital intensive, and the applications in these industries that require embedded flash and DRAM products are very vulnerable to failure.

In a defense environment, only the most rugged storage products can handle environmental challenges, such as shock and vibration, and extreme temperatures. These products must also handle vital security challenges, such as protecting sensitive data and preventing data breaches.

Since the technology in these industries changes quickly, and each defense application has its own specific requirements, working with storage vendors that can provide long-term support and ensure the long-term availability of products is crucial.

As a result, it is important for manufacturers not only to use the right storage products for aerospace and defense applications but also to work with the right storage vendors.

Requirements:

• *Compliant with MIL-STD standards*

• *Operational in extreme environments*

• *Data security*

• *Sustained (uninterrupted) performance*

• *Product longevity and support*

• *Customization*

Innodisk Storage

Innodisk's industrial embedded flash and DRAM storage meet all of today's aerospace and defense application requirements.

Innodisk's storage products are fully compliant with aerospace and defense standards, and are built with a wide array of features to ensure outstanding performance in extreme environments and security-sensitive situations.

With our InnoRobust® feature set, we not only guarantee that our storage products are fully protected against heat, dust, extreme cold and heat, shock, vibration, and other environmental stresses, but we also deliver industry-leading data protection technologies to keep sensitive information secure. Our flash storage and DRAM modules are also backed by a dedicated engineering support team, and come with BOM control and flexible customization options.

MIL-STD-810F/G Compliant

Military-Grade System Design Standard

Innodisk products meet the strict specifications set by United States Military Standards for all products used in military and defense applications.

MIL-I-46058C Compliant

Silicone Conformal Coating Standard

Innodisk products comply with conformal coating standards to ensure maximum protection in rugged environments.

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Innodisk's flash and DRAM storage products are used in a wide variety of aerospace and defense applications.

Innodisk embedded flash
and DRAM storage featuring
InnoRobust® are specially
designed for aerospace and
defense applications

InnoRobust® Feature Set

Rugged Design

Our flash and DRAM storage products are compliant with the United States Military Standard MIL-STD-810F/G, for operation in harsh environments. Our DRAM modules also extend the JEDEC SO-DIMM standard by 10 mm, for a more secure mount to the CPU board.

Conformal Coating

Our flash and DRAM storage products are compliant with the MIL-I-46058C silicone conformal coating standard for protection against moisture, dust, and chemicals.

Wide Temperature Range

Our flash and DRAM storage products are RoHS compliant and are protected against extreme weather conditions, remaining fully operational in temperatures ranging from -40ºC to +85ºC.

Thermal Sensor

Our flash and DRAM storage products have built-in thermal sensors to ensure data reliability and to prevent failures due to overheating.

iData Guard

iData Guard is our patented Power Cycling data management system, which helps to ensure SSD data integrity after sudden power outages. When the low power detector is triggered, a safe power-down recovery algorithm is executed, and the controller will complete the current operation.

(Available for flash only.)

iCell Power Failure Management

Our iCell technology uses buffer management to store data in volatile DRAM, to prevent the loss of valuable data during sudden power failures.

(Available for flash only.)

Advanced Data Security

Our comprehensive data security suite for SSDs includes QEraser, SEraser, write protect, and self-destruct functions.

(Available for flash only.)

Physical Destroy

We provide an ideal solution to fulfill the requirement of destroy data in SSD. With high voltage power supply and separated supply circuit to controller IC and flash IC, physical destroy mechanism is able to ensure data is destroyed exactly.

(Available for flash only.)

Golden Finger 30μ"

Our Golden Finger technology surpasses the JEDEC standard 3u" specification and delivers 30μ" pin width to DRAM modules for extra protection against scratches and environmental damage.

(Available for DRAM only.)

The Advantages of Our Products

Resistance to Severe Shock and Vibration

Innodisk's ruggedized design solves the problem of damage caused by severe shock and vibration. Our stringent testing and flexible design ensure rock-solid performance in military vehicles and aircraft that must operate in harsh conditions. In addition, our DRAM modules are clamped with through-holes, which further reduces the possibility of damage caused by shock and vibration.

Reduces the possibility of damage caused by shock and vibration.
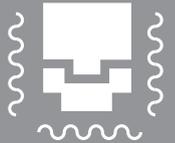
Ensures maximum protection in harsh environments.

Moisture-Proof, Dust-Proof, and Chemical-Proof

At Innodisk, we apply a protective coating to all our flash disks and DRAM modules that are designed for aerospace and defense applications. This conformal coating ensures maximum protection in harsh environments, where moisture, dust and other particles, and chemical exposure can destroy the operability of storage disks and DRAM modules.

Data Protection in Case of Abnormal Power Failure

Our proprietary iCell technology uses capacitors with voltage detectors to ensure the instant and reliable total transfer of buffer data to flash storage. iCell's sophisticated data buffer management guarantees that all buffer data is flushed to the flash chip before a total power loss.

Guarantees all buffer data is flushed to the flash chip before total power loss.

Ensures SSDs stay within temperature limits.
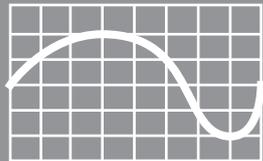
Prevention of Failure Due to Overheating

Innodisk's Thermal Sensor instructs the SSD to either change speed or throttle back on flash access, ensuring that the SSD stays within temperature limits, which, in turn, prevents failures due to overheating.

Operational in Extreme Temperatures

Mission-critical-grade vehicles and equipment operate in a wide range of temperatures, and stresses caused by very low or very high temperatures can lead to disk and memory failure. Our flash and DRAM modules are rigorously tested to ensure operability in extreme temperatures, ranging from -40°C to 85°C.

Operability in extreme temperatures, ranging from -40°C to 85°C.

Erases 128GB of data in seven seconds.

Data Security: Erase, and Destroy

Our data security system provides quick erase, and secure destroy technologies that meet the standards of the U.S. Navy, Air Force, and Army, the Department of Defense, the National Security Agency, and the National Industrial Security Program Operating Manual Supplement (NISPOMSUP). In addition, our proprietary QEraser function can erase 128GB data in just seven seconds.

Avoid ECC failure during an unexpected loss of power

Our iData Guard technology is comprised of a built-in low power detector and firmware power-down recovery algorithm that prevents ECC failure occurring caused by data inconsistencies due to loss of power. Once the low power detector is triggered by the accident, a safe power-down recovery algorithm is executed to help prevent data loss and ensure data integrity.

A patented and enhanced Power Cycling data management system to ensure data integrity

Our Service and Support

A Dedicated Engineering Support Team

Our dedicated engineering support team is available to ensure that all of our products for aerospace and defense applications are backed by a comprehensive service system. Our software, hardware, firmware, R & D, and field-application engineers all work closely together to provide world-class support for each and every aerospace and defense application.

BOM Control

Aerospace and defense data storage applications benefit from a fixed configuration, and fixed-BOM orders ensure product longevity and stability.

Customization

Our rugged products are specially tailored to fit the needs of each aerospace and defense application. A variety of speeds, capacities, sizes, and data security options are available for customization. Our DRAM modules include low profile, 32-bit, SO-DIMM, Long DIMM, VLP-DIMM, Mini-DIMM, and single side for space maximization.

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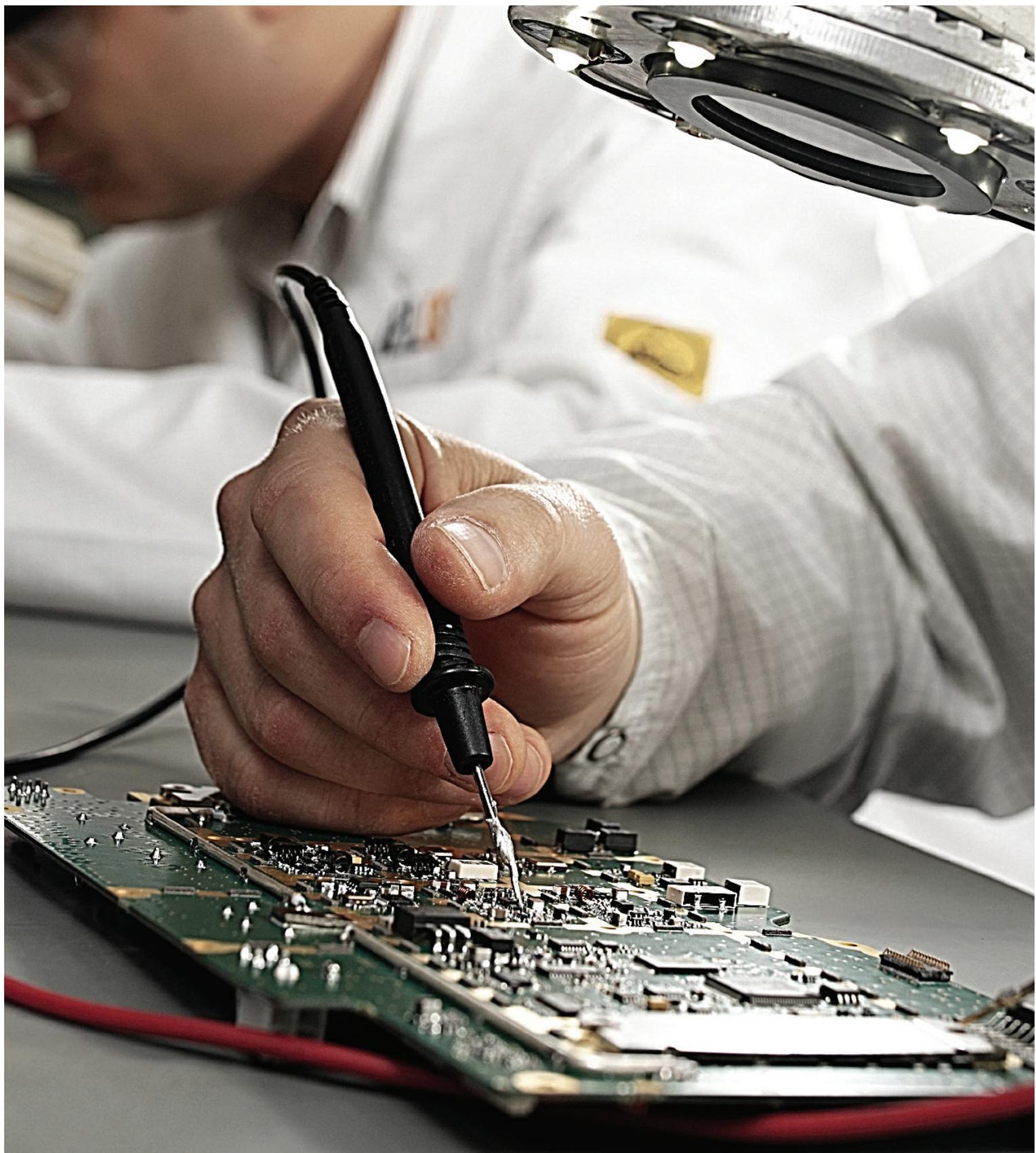
We are dedicated to providing
our customers with the absolute
best service.

High-Speed Airborne Applications

High-speed airborne data recorders, installed with SSDs ranging in capacity from 8GB to 512GB, are used in a range of military applications, such as radar, sonar, signal intelligence, and image processing. These SSDs function at a high-sustained data transfer rate, ranging from 90Mbytes/sec to 500Mbytes/sec. For this type of rugged SSD operation, high-speed and low-latency data streaming are crucial.

Real-World Applications

Innodisk Storage Products for High-Speed Airborne Applications

Ensuring normal operation in sub-zero flight conditions calls for tough, ruggedized SSD products. Innodisk's products for high-speed airborne data loggers include SSDs and DRAM modules with the InnoRobust® feature set. Our products provide all of the necessary shock and vibration protection, protective coating functionality, wide temperature operability, data security, and power failure management technology needed for this type of military-grade application.
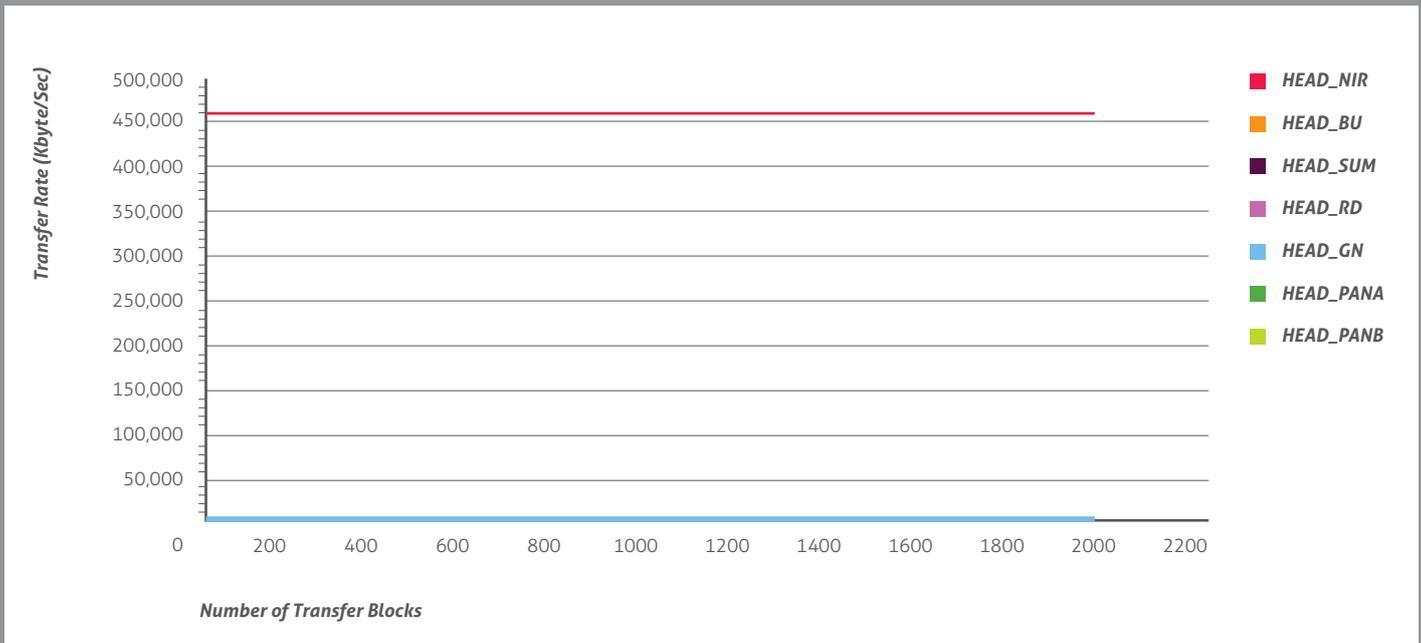
Innodisk's dedicated engineering support team ensures that the firmware for this application is customized to specific algorithm/data transfer requirements. Using customized firmware, our military-grade SSDs deliver sustained data capturing for high-speed airborne data logging.
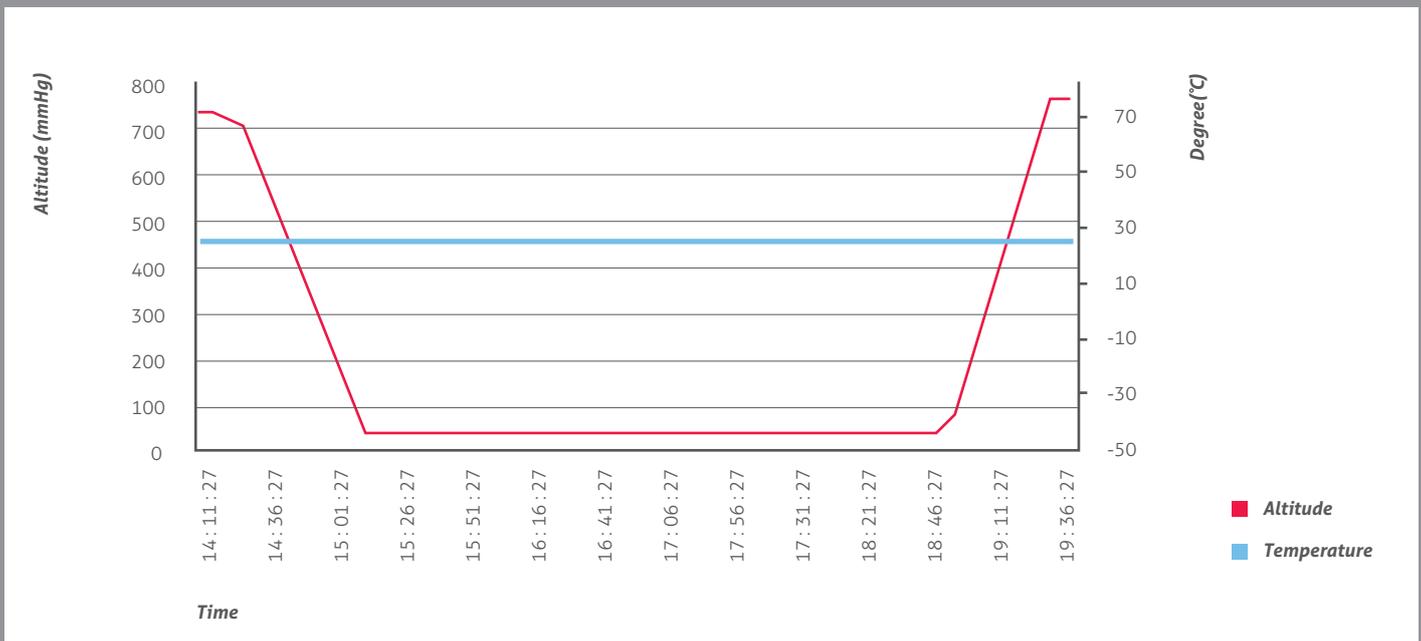
Application Story

Customized testing saves time and money for Defense Application

The situation

A valued Innodisk partner adopted our 128GB MLC 2.5" SSD and 64GB MLC SATA Slim with wide temperature and coating features in their land vehicle system for Defense Applications. They chose Innodisk MLC for its longer endurance, performance, stability and warranty

Task: Create a special testing process for extreme environments

Innodisk can offer a tailored testing process to meet specific requirements, such as extreme environments. In the case of our partner, they needed a strict thermal cycling test. Our standard procedure mandates that our wide temperature products are tested within a specialized chamber. The temperature is lowered to -40°C. We turn off the product, reboot and check the amount of later bad blocks. The same process is repeated while the temperature rises to 85°C.

For our partner's application, they required some additional steps. Our product needed to not only reboot while at the lowest and highest temperatures, but it needed to stay both -40°C and 85°C for fifteen minutes, then reboot and run for twenty minutes. With our in-house engineering team, we were able to complete the project successfully with drives that met their rigorous requirements.

The solution

Innodisk developed the MLC SSDs with our firmware architecture to have a longer lifespan compared to traditional MLC SSDs. Innodisk SSDs offer a wide range of advantages over commercial technologies, while keeping prices competitive. Among them are better performance, lower power consumption, and extreme shock resistance. Innodisk SSDs are able to work in a wide temperature range, from -40°C up to 85°C, deeming them ideal for the Defense markets.

We provide customized testing for our clients, based on application requirements. To meet Defense certification requirements, we are capable of sophisticated and in-house system level testing, to support our partners.

The payoff

Innodisk's customized testing takes the pressure off of our partners. They not only save time and money, they have peace of mind that our product will meet strict government requirements in a timely fashion. With guaranteed BOM control, Innodisk products have a longevity and stability that is unrivaled in the industry.

Flash Products

Innodisk flash products are designed for aerospace and defense through multi-ways to supply extremely high level data security
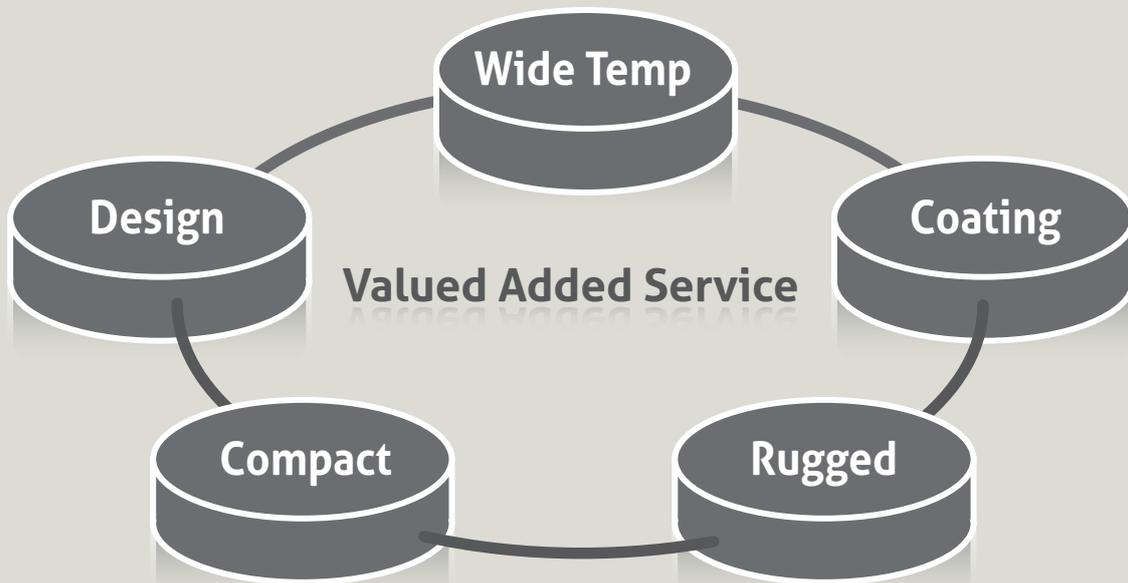

Featured here are 5 of Innodisk's advanced flash products for aerospace and defense applications.

Model Name	2.5" SATA SSD 3SR3-P	1.8" SATA SSD 3SR3-P	2.5" PATA SSD 1SR3-P	2.5" SATA SSD 3MR3-P	1.8" SATA SSD 3MR3-P
Key Features	1. Compliant with MIL-STD-810-F/G 2. HW/SW Data Security (QEraser/ Destroy/ SEraser/ Write Protect) 3. iCell supported, 100% data protection	1. Compliant with MIL-STD-810-F/G 2. SW Data Security (QEraser/Destroy/ SEraser/Write Protect)	1. Compliant with MIL-STD-810-F/G 2. SW Data Security (QEraser/Destroy/ SEraser/Write Protect)	1. Compliant with MIL-STD-810-F/G 2. HW/SW Data Security (QEraser/ Destroy/ SEraser/ Write Protect) 3. iCell supported, 100% data protection	1. Compliant with MIL-STD-810-F/G 2. SW Data Security (QEraser/Destroy/ SEraser/Write Protect)
Interface	SATA III 6.0Gb/s	SATA III 6.0Gb/s	SATA III 6.0Gb/s	SATA III 6.0Gb/s	SATA III 6.0Gb/s
Flash Type	SLC	SLC	SLC	MLC	MLC
Capacity	8GB-512GB	8GB-512GB	8GB-256GB	64GB-512GB	8GB-512GB
Max. Channel	4	4	4	4	4
Sequential R/W (MB/sec, max.)	490/340	490/340	90/90	480/220	480/220
Max. Power consumption	3.25W (5Vx650mA)	3.25W (5Vx650mA)	2.5W (5Vx500mA)	5W (5Vx1A)	5W (5V x 1A)
Thermal Sensor	STD: N W/T: Y				
External DRAM Buffer	Y	Y	Y	Y	Y
iCell	Y	N	Y	Y	N
TRIM	Y	Y	Y	Y	Y
ATA Security	Y	Y	Y	Y	Y
S.M.A.R.T	Y	Y	Y	Y	Y
Dimension (WxLxH/mm)	69.8 X 99.8 X 9.2	54.0x78.5x5.0	69.8 X 99.8 X 9.2	69.8 X 100.1 X 9.3	54.0x78.5x5.0
Environment	Vibration: 20G@7~2000Hz Shock: 1500G@0.5ms Storage Temperature: -55°C ~ +95°C MTBF: >3 million hours				
Standard temp. OP(0°C~+70°C)	DRS25-XXXD70SC***	DRS18-XXXD70SC***	DRP25-XXXD70SC***	DRS25-XXXD70%C***	DRS18-XXXD70%C***
Wide temp. OP(-40°C~+85°C)	DRS25-XXXD70SW***	DRS18-XXXD70SW***	DRP25-XXXD70SW***	DRS25-XXXD70%W***	DRS18-XXXD70%W***
Note	xxx = density (02GB=02G, 04GB=04G, 08GB=08G, 16GB=16G, 32GB=32G, 64GB=64G, 128GB=A28, 256GB=B56, 512GB=C12) ***= flash configuration (internal control code) %=Flash Type				

DRAM Products

Through excellent customized DRAM modules, Innodisk can offer a valued, expertise and total solution to customers.

Wide Temp

Design

Coating

Valued Added Service

Compact

Rugged

Featured here are 13 of Innodisk's advanced DRAM products for aerospace and defense applications.

	Rugged DIMM			Mini DIMM		
Module Type	DDR4	DDR3	DDR2	DDR4 Mini DIMM	DDR3 Mini DIMM	DDR3 Mini RDIMM
Data Rate	2133MT/s 2400MT/s	1333MT/s/1600MT/s 1866MT/s	400MT/s/533MT/s 667MT/s/800 MT/s	2133MT/s/2400 MT/s	1066MT/s/1333MT/s/1600 MT/s	
Capacity	4GB/8GB/16GB	1GB/2GB /4GB/8GB	1GB/2GB	4GB/8GB/16GB	2GB/4GB	2GB/4GB/8GB
Function	Non-ECC Unbuffered Memory			With ECC Unbuffered Memory		Registered Memory
Pin Number	260 pin	204 pin	200 pin	288 pin	244 pins	
Width	32 Bits/64 Bits			72 Bits		
Voltage	1.2V	1.35V/1.5V	1.8V	1.2 V	1.5V / 1.35V	
PCB Height	1.18 inches		1.53 inches	0.72 inch (VLP)	0.72 inch (VLP) 0.7 inch (ULP)	1.18 inches 0.72 inch (VLP)
Operation Temperature	0℃ ~ 85 ℃			0℃ ~ 85 ℃		
1GB	-	M3G0-1GSJCCXX	M2G0-1GSFOCXX	-	-	-
2GB	-	M3G0-2GSJCCXX	M2G0-2GSFOCXX	-	M3M0-2GSJOCXX	M3M0-2GSJVCXX
4GB	M4G0-4GSSXXXX	M3G0-4GSSDCXX	-	M4M0-4GS1YCXX	M3M0-4GSSOCXX	M3M0-4GSSVCXX
8GB	-	M3G0-8GSSDCXX	-	M4M0-8GS1YCXX	-	M3M0-8GSSWCXX
16GB	-	-	-	M4M0-AGS1YCXX	-	-
	Speed Reference: 400 MT/s= G3, 533 MT/s=H4, 667 MT/s=J5, 800 MT/s=K6 1066 MT/s=M7, 1333 MT/s=N9, 1600 MT/s=PC, 1866 MT/s=QE, 2133 MT/s=RG, 2400 MT/s=SJ					

	Wide Temperature		
Module Type	DDR4 Long DIMM/ SODIMM ECC DIMM/ ECC SODIMM	DDR3 Long DIMM/ SODIMM ECC DIMM/ ECC SODIMM	DDR2 Long DIMM/ SODIMM
Data Rate	2133MT/s	1333MT/s/1600MT/s/1866MT/s	400MT/s/533MT/s/667MT/s/800 MT/s
Capacity	4GB/8GB/16GB	1GB/2GB/4GB/8GB	512 MB/1GB/2GB
Function	With or without ECC		Non ECC Unbuffered Memory
Pin Number	288/260 pin	240/204 pin	240/200 pin
Width	64/72 Bits	64/72 Bits	64 Bits
Voltage	1.2V	1.35V/ 1.5V	1.8V
PCB Height	1.23 inches/ 1.18 inches	1.18 inches	1.18 inches
Operation Temperature	-40°C ~ 85 °C		
512MB	-	-	M2U0-12PC7IXX M2S0-12PC5IXX
1GB	-	M3S0-1GSFC5XX	M2U0-1GMF7IXX M2S0-1GMF5IXX
2GB	-	M3S0-2GSJC5XX	M2U0-2GMFQIXX M2S0-2GMF6IXX
4GB	M4U0-4GSSJ5XX M4S0-4GSSN5XX M4C0-4GSSL5XX	M3S0-4GSSC5XX	-
8GB	M4U0-8GSSK5XX M4S0-8GSSO5XX M4S0-8GS1N5XX M4D0-8GSSQ5XX M4D0-8GS1P5XX	M3S0-8GSSD5XX	-
16GB	M4U0/AGS1K5XX M4S0-AGS1O5XX	-	-
Speed Reference: 400 MT/s= G3, 533 MT/s=H4, 667 MT/s=J5, 800 MT/s=K6 1066 MT/s=M7, 1333 MT/s=N9, 1600 MT/s=PC, 1866 MT/s=QE, 2133 MT/s=RG, 2400 MT/s=SJ			

	DIMM/SODIMM		DIMM/ SODIMM w/ECC	
Module Type	DDR4 SODIMM	DDR4 Long DIMM	DDR4 SODIMM	DDR4 Long DIMM
Data Rate	2133MT/s/2400MT/s		2133MT/s/2400 MT/s	
Capacity	2GB/4GB/8GB/16GB	4GB/8GB/16GB	4GB/8GB/16GB	
Function	Non-ECC Unbuffered Memory		With ECC Unbuffer Memory	
Pin Number	260 pin	288 pin	260 pin	288 pin
Width	64 Bits		72Bits	
Voltage	1.2V		1.2V	
PCB Height	1.18 inches	1.23 inches	1.18 Inches	1.23 inches
Operation Temperature	0°C ~ 85 °C		0°C ~ 85 °C	
2GB	M4S0-2GSVZCXX	-	-	-
4GB	M4S0-4GSSNCXX	M4U0-4GSSJCXX	M4D0-4GSSPCXX	M4C0-4GSSLCXX
8GB	M4S0-8GSSOCXX	M4U0-8GSSKCXX	M4D0-8GSSQCXX	M4C0-8GSSMCXX
16Gb	M4S0-AGS1OCXX	M4U0-AGS1KCXX	M4D0-AGS1QCXX	M4C0-AGS1MCXX
Speed Reference: 400 MT/s= G3, 533 MT/s=H4, 667 MT/s=J5, 800 MT/s=K6 1066 MT/s=M7, 1333 MT/s=N9, 1600 MT/s=PC, 1866 MT/s=QE, 2133 MT/s=RG, 2400 MT/s=SJ				

About Innodisk

Innodisk is a service driven provider of flash and DRAM products for the industrial and enterprise applications. Our team has the experience and expertise that comes directly from our focus on the industrial segment, and is bolstered by having our own firmware team and factory. With satisfied customers across the embedded, aerospace and defense, in-vehicle computing and more, we have set ourselves apart with a commitment to dependable products and unparalleled service. This has resulted in products including embedded peripherals designed to supplement existing industrial solutions. The expanded business lines are leading our next step in being a comprehensive solution and service provider in industrial storage industry.

Absolute Service

Service is not just what we do. It's who we are.

Absolute Service is our pledge and our guide. It infuses everything we do at Innodisk.

Absolute Service is our promise to deliver the most comprehensive service in every situation. It's the philosophy that guides us in all interactions with our customers and business partners. It's the spirit of friendliness and enthusiasm that fills each member of the Innodisk team.

Absolute Service is our absolute commitment to our customers.

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