

2017 Edition

Innodisk In-Vehicle Solutions

Storage, Memory and Embedded Peripherals
for the In-vehicle Industry



innodisk

Introduction



Applications

- Heavy-duty vehicles (in-vehicle network)
 - Military
 - Agriculture/ Forestry
 - Mining
- Fleet Management Systems
- Recreational Vehicles
- Marine Navigation Systems
- Stationary system using vehicle components
- Rugged Computers
- Onboard surveillance systems
- Vehicle computers

Many might not be aware of the staggering amount of technology that goes into the design of modern-day vehicles. Compared to the first cars to come off the assembly line more than a century ago, today's vehicles hide a lot of sophistication under the hood.

Vehicles operate in just about any environment imaginable, which means any system onboard has to withstand the stress induced by changes in temperature and other rough conditions. Another challenge is electromagnetic interference both from the environment and from other onboard systems, as well as unstable power supply. The third crucial factor for in-vehicle systems is solving the space and weight restrictions; a more compact setup frees up more space, and less weight means lower fuel-consumption.

Fleet management is becoming increasingly important for operators. Increased capacities for data collection allows for advanced tracking and diagnostics, speed and fuel management, driver management and health and safety management.

The Innodisk Solution

Extreme temperatures and constant thermal cycling can cause damage and severely reduce product lifespan. Innodisk in-vehicle products are tested and certified for operations in temperatures ranging from -40°C to 85°C . With integrated thermal sensors, Innodisk SSD can detect temperature spikes and efficiently throttle performance to avoid overheating.

By complying with the US MIL-STD-810G our products are certified to withstand the stringent shock and vibration sustained during operation. DRAM modules also sport mounting holes for much more rugged attachment to the motherboard. Conformal coating is available for all modules, and can ensure protection from dust, dirt and humidity.

Our in-vehicle line of products all comply with SAE J1113 (US), and ISO 7637-2 standards ensuring modules remain unaffected by electromagnetic interference. With an often unstable power supply onboard systems are in danger of data loss; for this reason we utilize a combination of firmware and hardware technology to ensure data protection.

With a dedicated firmware team and a variety of available form factors and connection alternatives, we can ensure a tailor-made solution that fits any in-vehicle application.



Ensuring the Safest Delivery

Characteristics of Innodisk's In-vehicle Computing Storage Products



Challenge 1 :

Electromagnetic Interference (EMI) disturbance from multiple systems in vehicles

Solution :

EMI resistant by automotive standards

Innodisk is the first peripheral supplier to obtain the European E-Mark certification and the only storage solution provider with multiple in-vehicle computing compliant standards for EMI. There are many electronic devices in a vehicle and our certified products ensure no EMI disturbance will affect your data. We certify all products designed for this application before they are integrated into vehicle systems.

Challenge 2 :

Power supply instability

Solution :

Exclusive iCell and iData Guard technologies to protect your data during abnormal power loss

Innodisk's exclusive iCell and iData Guard are integrated SSD technologies that utilize our firmware and hardware designs. In the event of an abnormal power loss, the data protection algorithm activates and holds data commands from the host. This design can prevent incomplete data from being recorded and corrupting valid data on the device. The iCell's multiple capacitor design provides a battery backup so that the external DRAM can be safely saved to flash storage.

Challenge 3 :

Power shortage in vehicles

Solution :

Low power consumption (DEVSLP)

Energy consumption and efficiency of fuel usage are the keys to maintaining optimal performance of a vehicle's system. Innodisk's SSD supports an extremely low power consumption mode by using DEVSLP. In this hibernation operation mode, our SSD only consumes as little as 5mWs. This will help the embedded system become more eco-friendly and cost effective.

Challenge 4 :

High temperatures affecting in-vehicle systems

Solution :

Thermal sensor

Built-in thermal sensor inside the SSD will throttle the performance to prolong the operation of the drive to meet thermal limits. Dynamic throttle is a technique in computer architecture whereby the frequency of a microprocessor can be automatically adjusted on the fly, in order to get a more stable operation behavior.

Challenge 5 :

Military standard shock-resistance and rugged DRAM design

Solution :

Military standard shock-resistance and rugged DRAM design

Our in-vehicle computing flash and DRAM products are compliant with the US military standard MIL-STD-810G, for shock and vibration. Normally the PCB and the main board are connected by a slot, but our rugged DRAM design uses a customized mounting pad, which makes the device less likely to be affected by vibrations. In addition, it interrupts the signals of the gold finger contacts and ensures more reliable and stable DRAM operation.

Challenge 6 :

The dusty and humid environment of the vehicle

Solution :

Conformal coating to protect the open components on a circuit board

Innodisk has the in-house ability to apply conformal coating on flash and DRAM PCBs. The conformal coating is a non-conductive cover that is about 0.03-0.13 mm thick. It is compliant with MIL- I-46058C, and acceptable by IPC-A-610 electronic component standards. All coated components are resistant to moisture, dirt, dust, and chemicals. Innodisk is proud to partner with industry leader HumiSeal for our raw materials. The entire process takes place in a dust-free facility to prevent other substances from contaminating the product during transportation.

Challenge 7 :

In-vehicle computing systems are built on different platforms

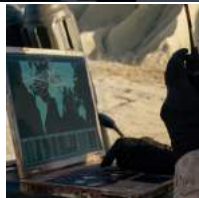
Solution :

Extensive portfolio supporting ARM architecture

Innodisk carries 32-bit DRAM modules to support the ARM platforms which are generally designed for their low cost as well as low power consumption. ARM architectures are predominately designed into mobile and tablet applications.

Applications

Still using average storage products for your in-vehicle systems?



Innodisk's in-vehicle computing storage solutions can help you face the challenges of the harsh interior environments of vehicles.

Our Production



Innodisk flash memory products and DRAM modules are produced in our own industrial-grade factory to ensure consistent product quality. All products passed a 3 minutes long rigorous vibration test to make sure the products can work properly in extreme conditions and to meet the standards of a wide range of industrial, military, and server applications. With own purpose-built memory production facility, we can provide flexible production that caters to our customers' needs, as well as increase productivity, provide on-time delivery, and ensure a steady, continuous supply of products.



All products passed a 3 minutes long rigorous vibration test to make sure the products can work properly in extreme conditions

Flash Products



Model Name	2.5" SATA SSD 3MG2-P	2.5" SATA SSD 3ME4	mSATA 3MG2-P	mSATA 3SE4
Key Features	<ol style="list-style-type: none"> 1. EverGreen L² architecture 2. High Sequential/IOPS performance 3. Support DEVSLP 4. iData Guard Protection 	<ol style="list-style-type: none"> 1. Exclusive L³ architecture 2. Designed with LDPC ECC engine 3. Excellent IOPS performance 4. Support hardware write protect 	<ol style="list-style-type: none"> 1. High IOPS by on-board DRAM design 2. Featuring L² architecture, the life span of the MLC SSD is maximized 3. DEVSLP supported 	<ol style="list-style-type: none"> 1. High quality SLC-based solution 2. DRAM-less, high-level data integrity 3. LDPC technology secures SSD reliability 4. Excellent data transfer speed
Interface	SATA III 6.0Gb/s	SATA III 6.0Gb/s	SATA III 6.0Gb/s	SATA III 6.0Gb/s
Flash Type	MLC	SLC	MLC	SLC
Capacity	8GB-2TB	8GB-256GB	8GB-512GB	8GB-64GB
Max. Channel	4	2	4	2
Sequential R/W (MB/sec, max.)	520/480	530/210	520/450	525/350
Max. Power Consumption	6W (5V x 1.2A)	1.5W (3.3V x 420mA)	2.2 W (3.3 V x 660 mA)	1.32W(3.3V x 400mA)
Thermal Sensor	Y	Y	Y	Y
ATA Security	Y	Y	Y	Y
S.M.A.R.T	Y	Y	Y	Y
Dimension (WxLxH/mm)	69.8 x 100.1 x 6.9 69.8 x 100.0 x 9.5 (2TB)	69.85 x 100.10 x 6.9	29.85 x 50.8 x 3.6	29.85 x 50.8 x 3.7
Environment	Vibration: 20G@7~2000Hz Shock: 1500G@0.5ms Storage Temperature: -55°C ~ +95°C MTBF: >3 million			
Standard Temp. OP (0°C~+70°C)	DGS25-XXXD81%C*** (P)	DES25-XXXM41SC***	DGMSR-XXXD81SC***	DEMSR-XXXM41SC***
Wide Temp. OP (-40°C~+85°C)	DGS25-XXXD81%W*** (P)	DES25-XXXM41SW***	DGMSR-XXXD81SW***	DEMSR-XXXM41SW***
Notes	XXX = density (02GB=02G, 04GB=04G, 08GB=08G, 16GB=16G, 32GB=32G, 64GB=64G, 128GB=A28, 256GB=B56, 512GB=C12, 1TB=01T, 02T-02T) ***= flash configuration (internal control code) %=Flash Type			



Model Name	CFast 3SE4	CFast 3ME4	Model Name	iCF 1SE	iCF 1ME
Key Features	<ol style="list-style-type: none"> 1. High quality SLC-based solution 2. DRAM-less, high-level data integrity 3. LDPC technology secures SSD reliability 4. Excellent data transfer speed 	<ol style="list-style-type: none"> 1. Exclusive L³ architecture 2. Designed with LDPC ECC engine 3. Excellent IOPS performance 4. Support hardware write protect 	Key Features	High quality SLC-based solution	<ol style="list-style-type: none"> 1. Budget friendly MLC-based solution 2. Enhanced power cycling management
Interface	SATA III 6.0Gb/s	SATA III 6.0Gb/s	Interface	PATA	PATA
Flash Type	SLC	MLC	Connector	50pin CF connector	50pin CF connector
Capacity	8GB-64GB	8GB-256GB	Flash Type	SLC	MLC
Max. Channel	2	2	Capacity	512MB-8GB	8GB-256GB
Sequential R/W (MB/sec, max.)	520/360	530/210	Max. Channel	2	2
Max. Power Consumption	1.59W (3.3V x 480mA)	0.86W (3.3V x 260mA)	Sequential R/W (MB/sec, max.)	40/30	110/110
Thermal Sensor	Y	Y	Max. Power consumption	0.75W(5V x 150mA) 0.5W(3.3V x 150mA)	1.05w(5V x 210mA) 0.69W(3.3V x 210 mA)
ATA Security	Y	Y	Environment	Vibration: 20G@7~2000Hz Shock: 1500G@0.5ms Storage Temperature: -55°C ~ +95°C MTBF: >3 million	
S.M.A.R.T	Y	Y			
Dimension (WxLxH/mm)	42.8 x 36.4 x 3.6	42.8 x 36.4 x 3.6	Standard Temp. OP (0°C~+70°C)	DC1M-XXXD41AC***	DECFC-XXXD53BC***
Environment	Vibration: 20G@7~2000Hz Shock: 1500G@0.5ms Storage Temperature: -55°C ~ +95°C MTBF: >3 million		Wide Temp. OP (-40°C~+85°C)	DC1M-XXXD41AW***	DECFC-XXXD53BW***
Standard Temp. OP (0°C~+70°C)	DECFA-XXXM41SC***	DECFA-XXXM41BC***	Note	PIO mode 0-6 UDMA mode 0-4	PIO mode 0-6 UDMA mode 0-7
Wide Temp. OP (-40°C~+85°C)	DECFA-XXXM41SW***	DECFA-XXXM41BW***	Note	XXX = density (02GB=02G, 04GB=04G, 08GB=08G, 16GB=16G, 32GB=32G, 64GB=64G, 128GB=A28, 256GB=B56) ***= flash configuration (internal control code) %=Flash Type	
Notes	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		Note	XXX = density (02GB=02G, 04GB=04G, 08GB=08G, 16GB=16G, 32GB=32G, 64GB=64G, 128GB=A28, 256GB=B56) ***= flash configuration (internal control code) %=Flash Type	

DRAM Products



Series	Wide Temperature		
Module Type	DDR4 LONG DIMM	DDR4 SODIMM	DDR3 LONG DIMM
Data Rate	2133 MT/s, 2400 MT/s	2133 MT/s, 2400 MT/s	1066 MT/s, 1333 MT/s, 1600 MT/s
Capacity	4GB/8GB/16GB	4GB/8GB/16GB	1GB/2GB/4GB/8GB
Function	Non-ECC Unbuffered Memory		
Pin Number	288 pin	260 pin	240 pin
Width	64Bits	64Bits	64Bits
Voltage	1.2V	1.2V	1.5V/1.35V
PCB Height	1.18 Inches	1.18 Inches	1.18 inches
Operation Temperature	-40 ~ 85°C		
Value-Added Service (*Optional)	Conformal Coating/ Side Fill		



Series	DDR3 SODIMM	DDR2 SODIMM
Module Type	DDR3 SODIMM	DDR2 SODIMM
Data Rate	1066 MT/s, 1333 MT/s, 1600 MT/s, 1866 MT/s	533 MT/s, 667 MT/s, 800 MT/s
Capacity	1GB/2GB/4GB/8GB	512MB/1GB/2GB/4GB
Function	Non-ECC Unbuffered Memory	
Pin Number	204 pin	200 pin
Width	64Bits	64Bits
Voltage	1.5V/1.35V	1.8V
PCB Height	1.18 Inches	1.18 inches
Operation Temperature	-40 ~ 85°C	
Value-Added Service (*Optional)	Conformal Coating/ Side Fill	



Series	Very Low-Profile (VLP) Solution			
Module Type	DDR4 LONG DIMM	DDR4 SODIMM	DDR3 LONG DIMM	DDR3 SODIMM
Data Rate	2133 MT/s, 2400 MT/s, 2666 MT/s	2133 MT/s, 2400 MT/s, 2666 MT/s	1066 MT/s, 1333 MT/s, 1600 MT/s	1066MT/s, 1333MT/s, 1600MT/s
Capacity	4GB/8GB/16GB	4GB/8G	1GB/2GB/4GB/8GB/16GB	1GB/2GB/4GB/8GB
Function	Non-ECC Unbuffered Memory			
Pin Number	288 pin	260 pin	240 pin	204pin
Width	64Bits	64Bits	64Bits	64 Bits
Voltage	1.2V	1.2	1.35V / 1.5V	1.35V / 1.5V
PCB Height	0.738 Inches	0.7 Inches	0.738 inches	0.7 inches
Operation Temperature	0 ~ 85°C			
Value-Added Service (*Optional)	Conformal Coating/ Side Fill			



Series	XR-DIMM Solutions
Module Type	DDR4 SODIMM
Data Rate	2133MT/s, 2400MT/s, 2666MT/s
Capacity	4GB/8GB/16GB
Function	Unbuffered memory with ECC
Pin Number	300 pin
Width	64Bits
Voltage	1.2V
PCB Height	1.18 inches
Operation Temperature	0 ~ 85°C
Value-Added Service (*Optional)	Conformal Coating/ Side Fill

CANbus

CANbus is a simple, low-cost and effective wiring architecture that is commonplace in the automotive industry. Innodisk offers fast and robust CANbus expansion with extensive software support for easy system integration.



Complete Software Support

- CAN2.0B and J1939 API with complete sample code and GUI utility
- Supports both X86 and ARM (by project) system
- Support Windows, Linux, QNX
- Test utility with C/C++/C# sample code for faster integration

Rugged Hardware Design

- Complies with EN61000-4-5 2.5kV Surge protection
- Complies with IEC 60950-1:2005 + A1: 2009 + A2:2013 2.5kV HiPOT protection
- Complies with EN61000-4-2 (ESD) Air-15kV, Contact-8kV
- Supports use in temperatures from -40°C to 85°C



Key Features

1. CANbus 2.0B backward compatible with 2.0A
2. Support baud rate 100/125/250/500(default)/800/1000K
3. Support CAN message acceptance filter
4. Keep configuration after hardware reboot
5. Support Listen-only mode
6. Termination resistor enabled/disabled by jumper
7. Supports 3rd mounting hole and USB Pin header for out-of-card installation

Applications

 SocketCAN	 CAN 2.0A/2.0B	 Galvanic Isolation	 SAE J1939
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Model Name	EMUC-B202
Module Type	USB to dual isolated CANbus 2.0B/J1939 Module
Form-Factor	mPCIe
Input I/F	USB 2.0
Input Connector	mPCIe or 5Pin Header
Output I/F	CANbus 2.0B x 2
Output Connector	DB-9 x 2
Dimensions(W*L*H/mm)	30.0 x 50.9 x 6.1
Temperature	Wide temp : -40°~85°C
Order info.	EMUC-B202-W1 (CAN 2.0B) EMUC-B202-W2 (J1939)



Successful Story



Transportation of hazardous materials and fleet management

The Situation

A Chinese truck manufacturer approached Innodisk for a data recording solution for vehicles transporting hazardous materials. They were in need of a way to reliably store data as well as a way to connect to the onboard CANbus system to gather data from operations. This data would then be sent real-time to a centralized location for fleet management.

There are many risks associated with transportation of hazardous materials. Fire, explosion, environmental contamination and pollution are all potential catastrophic consequences of mismanagement. A solid on-board data recording system can help mitigate associated risks through efficient planning and fleet management and will help facilitate a safe journey from start to end.

Fleet management can also help mitigate risk factors associated with driver behavior. For instance, the vehicle operator is overspeeding or overloading, or not sticking to the planned route. These scenarios increase the risk of accidents and might also be indications of foul play.

Our Roadmap to Success

EMUC-B202 CANbus Module

- J1939 compliant
- Rugged design
- Wide temperature, -40°C to 85°C

3ME4 mSATA SSD

- High IOPS
- Rugged design
- Wide temperature, -40°C to 85°C

Challenges

1. Monitor and manage issues in a timely manner
2. Secure data recording of the whole journey from start to destination
3. Route planning and management
4. Harsh environment operations

Solutions

1. Fast and rugged network performance
2. Secure and fast data writing speeds
3. Wide temperature modules
4. Robust design

Result

To ensure that the customer could reliably record and transmit onboard data, Innodisk presented a solution with fast and durable components. With this in place, the client was able to efficiently monitor both the truck and operator behavior. This enabled effective planning, correct driver behavior and the timely resolution of any issues that occurred during transport. The solution helped streamline the transport process and increase productivity, saving costs for the operator, and more importantly, lowering the associated risks of transporting hazardous materials, creating an overall safer environment for the handling of hazardous materials.



Innodisk is a service-driven provider of flash memory, DRAM modules and embedded peripherals for industrial and enterprise applications. With satisfied customers across the embedded, aerospace and defense, cloud storage markets 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 and high IOPS flash arrays for industrial and enterprise applications. The expanded business lines are leading our next steps in being a comprehensive solution and service provider in the industrial storage industry.

Founded in 2005 and headquartered in Taipei, Taiwan, Innodisk services clients globally with engineering experts and sales teams in China, Europe, Japan, and the United States. With abundant experience and an unrivaled knowledge of the memory industry, Innodisk develops products with excellent quality, remarkable performance and the highest reliability.

For more information about Innodisk, please visit <http://www.innodisk.com>.

Our Advantages



Firmware Team

Our in-house firmware team has years of customization experience. This dedicated team responds quickly and accurately to customer requests and delivers highly reliable tailor-made solutions.



Intellectual Property

With over 62 product design patents, we develop innovative technology that enhances and benefits industrial applications.



Purpose-Built Factory

All Innodisk products are manufactured in our own industrial-grade factory. We utilize advanced production technology in both pre- and post-production stages to improve the protection of components.

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

Absolute Service

- 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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