innodisk

The Total Solution For Industrial Flash Storage

USB Drive 2SE

Customer: _____

Customer Part Number: _____

Innodisk Part Number: _____

Innodisk Model Name: _____

Date: _____

Innodisk Approver	Customer Approver

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REVISION HISTORY

Revision	Description	Date
1.0	First Release	May, 2013
1.1	Add TBW Modify mechanical dimensions	Sep, 2013

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1. Product Overview

1.1 Introduction of USB Drive

The Innodisk USB Drive products provide high capacity USB flash memory storage that electrically complies with High-speed USB 2.0 interface & backward compatible with USB 1.1. The device features attractive small form factor and the connectivity over USB2.0 and the NAND flash architecture provide a faster data transmission.

1.2 Product View

Figure 1: USB Drive 2SE

1.3 Product Models

USB Drive 2SE is available in follow capacities.

- USB Drive 2SE 512MB
- USB Drive 2SE 1GB
- USB Drive 2SE 2GB
- USB Drive 2SE 4GB
- USB Drive 2SE 8GB
- USB Drive 2SE 16GB

1.4 Capacity

USB Drive 2SE provides unformatted from 512MB up to 16GB capacities within SLC Flash IC.

1.5 VID/PID

Customize VID/PID(specify 4bits for each ID, Hexadecimal(0~F)

For Option, Default is 196D/0201.

2. Theory of operation

2.1 Overview

Figure 2 shows the operation of USB Drive 2SE from the system level, including the major hardware blocks.

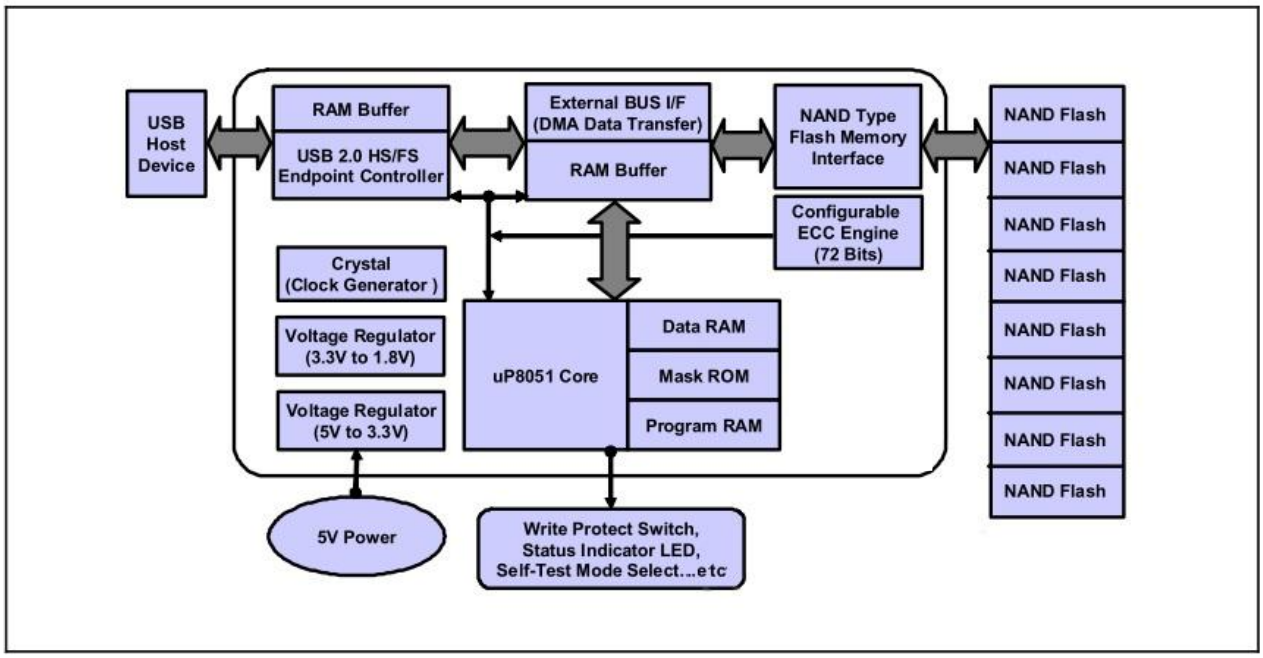


Figure 2: USB Drive 2SE Block Diagram

USB Drive 2SE integrates a USB2.0 controller and NAND flash memories. Communication with the host occurs through the host interface. Communication with the flash device(s) occurs through the flash interface.

2.2 Error Detection and Correction

Highly sophisticated Error Correction Code algorithms are implemented. The ECC unit consists of the Parity Unit (parity-byte generation) and the Syndrome Unit (syndrome-byte computation). This unit implements an algorithm that can correct 72 bits per 1024 bytes in an ECC block. Code-byte generation during write operations, as well as error detection during read operation, is implemented on the fly without any speed penalties.

2.3 Wear-Leveling

Flash memory can be erased within a limited number of times. This number is called the *erase cycle limit* or *write endurance limit* and is defined by the flash array vendor. The erase cycle limit applies to each individual erase block in the flash device.

USB Drive 2SE uses a static wear-leveling algorithm to ensure that consecutive writes of a specific sector are not written physically to the same page/block in the flash. This spreads flash media usage evenly across all pages, thereby extending flash lifetime.

2.4 Bad Blocks Management

Bad Blocks are blocks that contain one or more invalid bits whose reliability are not guaranteed. The Bad Blocks may be presented while the SSD is shipped, or may generate during the life time of the SSD. When the Bad Blocks is detected, it will be flagged, and not be used anymore. The SSD implement Bad Blocks management and replacement, Error Correct Code to avoid data error occurred. The functions will be enabled automatically to transfer data from Bad Blocks to spare blocks, and correct error bit. After the reserved block less than 40, the SSD will be locked, and cannot be written anymore.

3. Specifications

3.1 CE and FCC Compatibility

USB Drive 2SE conforms to CE and FCC requirements.

3.2 RoHS Compliance

USB Drive 2SE is fully compliant with RoHS directive.

3.3 Environmental Specifications

3.3.1 Temperature Ranges

Operating Temperature Range:

- Standard Grade: 0°C ~ +70°C
- Industrial Grade: -40°C ~ +85°C

Storage Temperature Range:

- Standard Grade: -55°C to +95°C

3.3.2 Humidity

Relative Humidity: 10-95%, non-condensing

3.3.3 Shock and Vibration

Reliability	Test Conditions	Reference Standards
Vibration	7 Hz to 2K Hz, 20G, 3 axes	IEC 68-2-6
Mechanical Shock	Duration: 0.5ms, 1500G, 3 axes	IEC 68-2-27

Table 1: Shock/Vibration Testing for USB Drive 2SE

3.3.4 Mean Time between Failures (MTBF)

Table 2 summarizes the MTBF prediction results for various USB Drive 2SE configurations. The analysis was performed using a RAM Commander™ failure rate prediction.

- Failure Rate: The total number of failures within an item population, divided by the total number of life units expended by that population, during a particular measurement interval under stated condition.

- Mean Time between Failures (MTBF): A basic measure of reliability for repairable items: The mean number of life units during which all parts of the item perform within their specified limits, during a particular measurement interval under stated conditions.

Product	Condition	MTBF (Hours)
USB Drive 2SE	Telcordia SR-332 GB, 25°C	>3,000,000

Table 2: USB Drive 2SE MTBF

3.3.5 Terabyte Written (TBW)

Parameter	Value
Flash Endurance	>100,000 P/E cycles
TBW(Sequential Write)	
512MB	35
01GB	65
02GB	135
04GB	275
08GB	550
16GB	1100

Table 3: USB Drive 2SE TBW

3.4 Golden finger

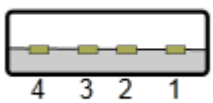
30μ”

3.5 Pin Assignment

USB Drive 2SE is designed within USB2.0 Interface. Particularly, its built-in power pin enables the device more compactable. Table 3 demonstrates USB Drive 2SE pin assignments.

Pin No.	Name	Description
1	VBUS	+5V
2	D-	Data -
3	D+	Data +
4	GND	Ground

Table 4: USB Drive 2SE Pin Assignment



Type A

3.6 Mechanical Dimensions

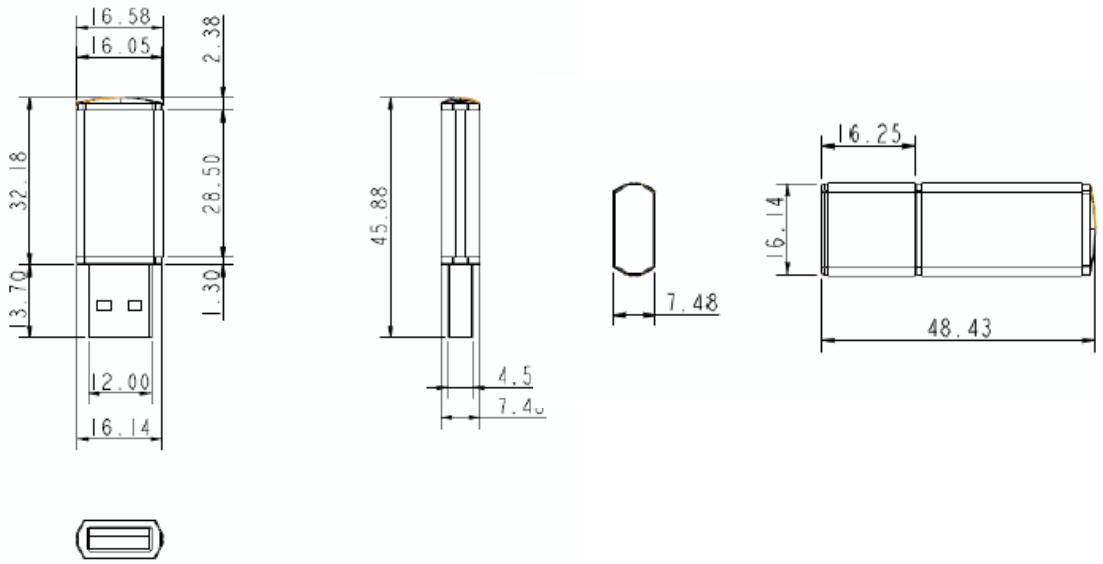


Figure 3: USB Drive 2SE mechanical dimensions

3.7 Weight

10g±2

3.8 Performance

Product name		512MB	1GB	2GB	4GB	8GB	16GB
USB Drive 2SE (Max.)	Sequential Read	24 MB/S	24 MB/S	24 MB/S	26 MB/S	26 MB/S	28 MB/S
	Sequential Write	18 MB/S	20 MB/S	20 MB/S	24 MB/S	24 MB/S	24 MB/S

3.9 NAND Flash Memory

USB Drive 2SE uses Single Level Cell (SLC) NAND flash memory, which is non-volatility, high reliability which has 100,000 program/erase times and high speed memory storage.

4. Electrical Specifications

4.1 Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Storage Temperature	TStorage	-55 ~ +95	°C
Ambient Operating Temperature	Ta	0 ~ +70	°C
3.3V supply voltage	VCC33	-0.3 ~ 3.6	V
1.8V supply voltage	VCC18	-0.3 ~ 2	V
3.3V buffer input voltage	Vin33	-0.3 ~ 3.6	V
3.3V/5V buffer input voltage	Vin335	-0.3 ~ 5	V
1.8V buffer input voltage	Vin18	-0.3 ~ 2	V

Table 5: USB Drive 2SE Absolute Maximum Ratings

4.2 Operating Conditions

Item	Symbol	Rating	Unit
USB 5V supply voltage	USBVin	3.2 ~ 5.5	V
3.3V supply voltage	VDD33	3.0 ~ 3.6	V
1.8V supply voltage	VDD18	1.6 ~ 2	V

Table 6: USB Drive 2SE Operating Conditions

4.3 Power Consumption

Mode	Power Consumption
Read	170 mA (max.)
Write	160 mA (max.)
Idle	110 mA (max.)
The power consumption is based on 16GB Model.	

Table 7: Power Consumption

4.4 Device Parameters

USB Drive device parameters listed in Table 7.

Capacity	LBA	User capacity (MB)
512MB	982016	479
1GB	2014208	983
2GB	4028416	1967
4GB	8105984	3958
8GB	16211968	7916
16GB	32481280	15860

Table 8: Device parameters

5. Part Number Rule

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	D	**E**	**U**	**A**	**1**	**-**	**0**	**8**	**G**	**I**	**7**	**2**	**A**	**C**	**1**	**S**	**B**			
Description	Disk	Form Factor				-	Capacity			Category			Flash mode	Operation Temp.	PCB Version	Channel	Flash		Customized Code	

Definition	
Code 1st (Disk)	**Code 14th (Operation Temperature)**
D: Disk	C: Standard Grade (0℃~ +70℃)
Code 2nd ~ 5th (Form Factor)	W: Industrial Grade (-40℃~ +85℃)
EUA1: USB Drive	**Code 15th (PCB Version)**
Code 7th ~9th (Capacity)	1: First Version
512M: 512MB 01G: 1GB	2: Second Version
02G: 2GB 04G: 2GB	**Code 16th (Channel)**
08G: 8GB 16G: 16GB	S: Single
Code 10th ~12th (Category)	**Code 17th (Flash)**
I72: USB Series	B: Toshiba SLC
Code 13th (Flash mode)	
A: Async Flash	

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RoHS 自我宣告書(RoHS Declaration of Conformity)

一、 宜鼎國際股份有限公司（以下稱本公司）特此保證售予貴公司之所有產品，皆符合歐盟 2002/95/EC 關於 RoHS 之規範要求。

InnoDisk Corporation declares that all products sold to the company, are complied with European Union RoHS Directive (2002/95/EC) requirement

二、 本公司同意因本保證書或與本保證書相關事宜有所爭議時，雙方宜友好協商，達成協議。

InnoDisk Corporation agrees that both parties shall settle any dispute arising from or in connection with this Declaration of Conformity by friendly negotiations.

Name of hazardous substance	Limited of RoHS ppm（mg/kg）
Cd	< 100 ppm
Pb	< 1000 ppm
Hg	< 1000 ppm
Chromium VI（Cr+6）	< 1000 ppm
Polybromodiphenyl ether（PBDE）	< 1000 ppm
Polybrominated Biphenyls（PBB）	< 1000 ppm

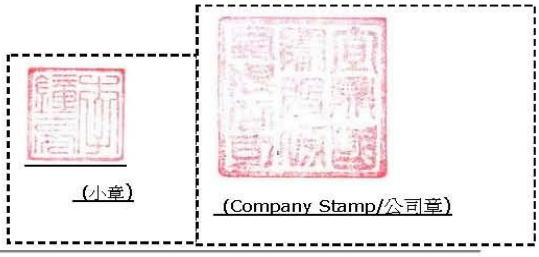
立 保 證 書 人

Company name 公司名稱： InnoDisk Corporation 宜鼎國際股份有限公司

Company Representative 公司代表人： Richard Lee 李鐘亮

Company Representative Title 公司代表人職稱： Chairman 董事長

Date 日期： 2011 / 10 / 20



(小章) (Company Stamp/公司章)

Verification of Compliance

Product Name	:	**USB Drive 2ME/2SE**
Model Number	:	**DEUA1-XXXI72#%※&＊** **XXX：512MB~16GB** **#：Flash Mode** **%：Temperature (C：Commercial Temp W：Industrial Temp, E: Extended Temp)** **※: PCB Version (A, B, C…. or 1, 2, 3…)** **&：Channel（S：Single, D：Dual）** **＊：Flash Vender（T：Micron SLC, S：Samsung SLC, N：Micron MLC, B：Toshiba SLC, C: Toshiba MLC）**
Applicant	:	**InnoDisk Corporation**
Address	:	**9F, No.100, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221, Taiwan**
Report Number	:	**O22-U070-1302-270**
Issue Date	:	**April 16, 2013**
Applicable Standards	:	**EN 55022:2010 Class B ITE** **AS/NZS CISPR22:2009 Class B ITE** **EN 55024:2010** EN 61000-4-2:2009 EN 61000-4-3:2006+A1:2008+A2:2010 EN 61000-4-4:2004+A1:2010

Based on the EMC Directive 2004/108/EC and the specifications of the customer, one sample of the designated product has been tested in our laboratory and found to be in compliance with the EMC standards cited above.

CE

TAF 0905
FCC CAB Code TW1053
NVLAP Lab Code 200575-0
IC Code 4699A
VCCI Accep. No. R-1527, C-1609, T-1441, G-10, C-4400, T-1334, G-614

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(Tsun-Yu Shih/ General Manager)

Date: April 16, 2013

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Product Name	:	**USB Drive 2ME/2SE**
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Applicable Standards	:	**FCC Part 15, Subpart B Class B ITE** **ANSI C63.4:2009** **Industry Canada ICES-003 Issue 5** **CSA-IEC CISPR22-10 Class B ITE**

One sample of the designated product has been tested in our laboratory and found to be in compliance with the FCC rules cited above.

NVLAP LAB CODE 200575-0

TAF 0905

FCC CAB Code TW1053

IC Code 4699A

VCCI Accep. No. R-1527, C-1609, T-1441, G-10, C-4400, T-1334, G-614

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Date: April 16, 2013