innodisk

The Total Solution For Industrial Flash Storage

USB EDC Horizontal 2ME

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	Mar, 2013
1.1	Add extended grade information Modify performance Modify power consumption Remove endurance	May, 2013
1.2	Add TBW Modify mechanical drawing	Sep, 2013
1.3	Add A19 PN number and remove flash endurance SPEC	Jan, 2015
1.4	Modify the operating temperature range to industrial Grade	Mar, 2015
1.5	Modify TBW	Oct, 2015
1.6	Add Toshiba 15nm Flash descriptions	Mar, 2016
1.7	Remove 4GB Modify performance Modify power consumption	Apr, 2016
1.8	Modify power requirement Add mechanical tolerance	Oct, 2016

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1. Product Overview

1.1 Introduction of USB EDC

The Innodisk USB EDC (Embedded Disk Card) 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 EDC Horizontal 2ME

1.3 Product Models

USB EDC Horizontal 2ME is available in follow capacities.

- USB EDC Horizontal 2ME 8GB
- USB EDC Horizontal 2ME 16GB
- USB EDC Horizontal 2ME 32GB
- USB EDC Horizontal 2ME 64GB
- USB EDC Horizontal 2ME 128GB

1.4 Capacity

USB EDC Horizontal 2ME provides unformatted from 4GB up to 128GB capacities within MLC 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 EDC Horizontal 2ME from the system level, including the major hardware blocks.

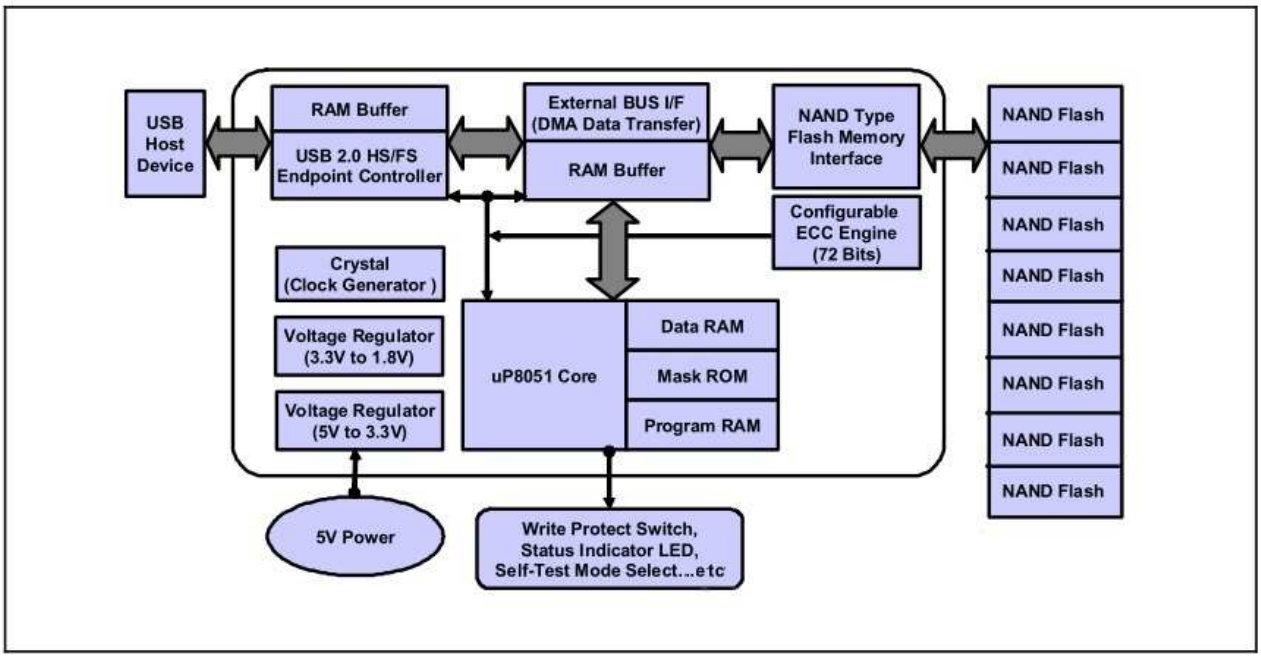


Figure 2: USB EDC Horizontal 2ME Block Diagram

USB EDC Horizontal 2ME 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 EDC Horizontal 2ME 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 EDC Horizontal 2ME conforms to CE and FCC requirements.

3.2 RoHS Compliance

USB EDC Horizontal 2ME is fully compliant with RoHS directive.

3.3 Environmental Specifications

3.3.1 Temperature Ranges

Operating Temperature Range:

- Standard Grade: 0℃ ~ +70℃
- Industrial Grade: -40℃ ~ +85℃

Storage Temperature Range:

- Standard Grade: -55℃ to +95℃

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 EDC Horizontal 2ME

3.3.4 Mean Time between Failures (MTBF)

Table 2 summarizes the MTBF prediction results for various USB EDC Horizontal 2ME 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 EDC Horizontal 2ME	Telcordia SR-332 GB, 25℃	>3 ,000,000

Table 2: USB EDC Horizontal 2ME MTBF

3.3.5 Terabyte Written (TBW)

Parameter	Value
TBW(Sequential Write)	Unit: TB
08GB	21.6
16GB	43.2
32GB	86.4
64GB	172.8
128GB	345.6

Table 3: USB EDC Horizontal 2ME TBW

3.4 Pin Assignment

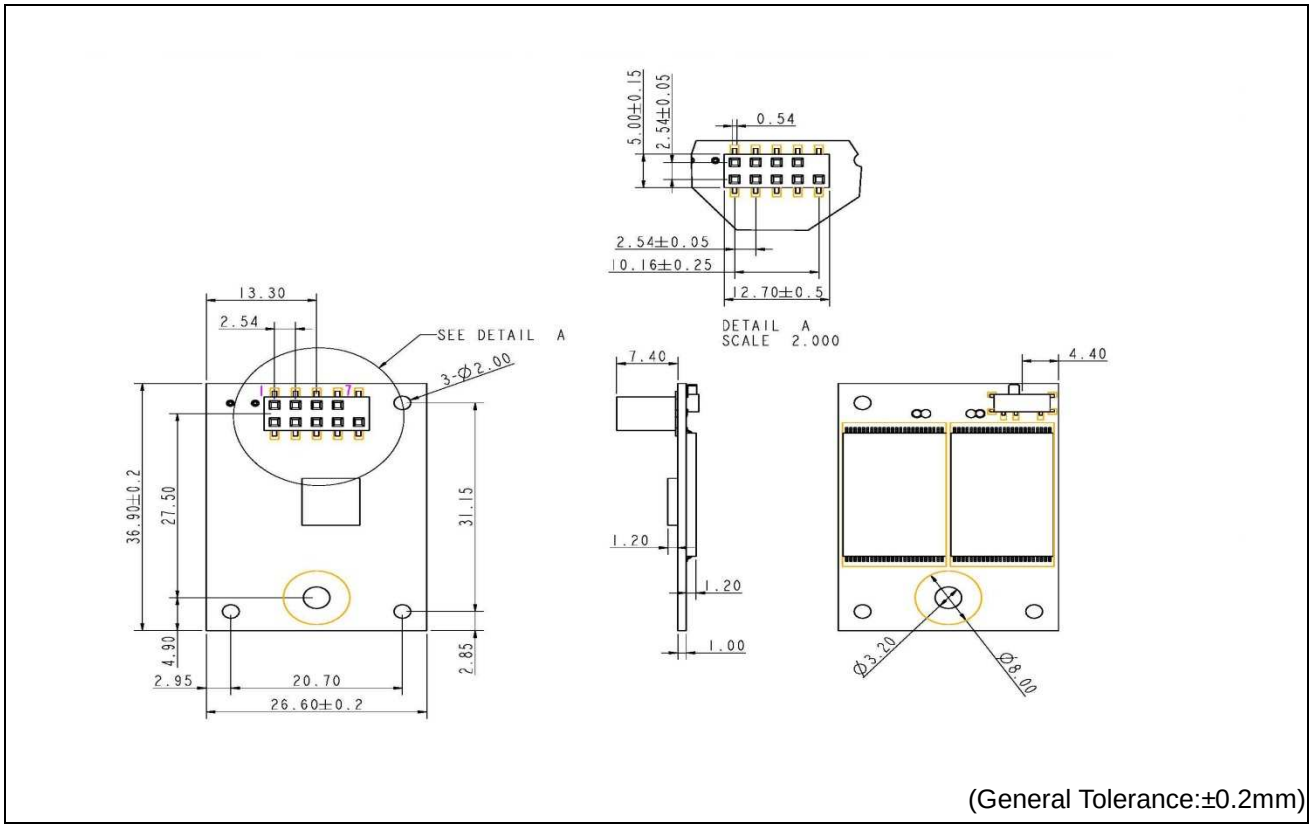
USB EDC Horizontal 2ME is designed within USB2.0 Interface. Particularly, its built-in power pin enables the device more compactable. Table 3 demonstrates USB EDC Horizontal 2ME pin assignments.

Horizontal Type			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	+5VDC	**2**	NC
3	USB Data(-)	**4**	NC
5	USB Data(+)	**6**	NC
7	GND	**8**	NC
9	NC	**10**	NC

Table 4: USB EDC Horizontal 2ME Pin Assignment

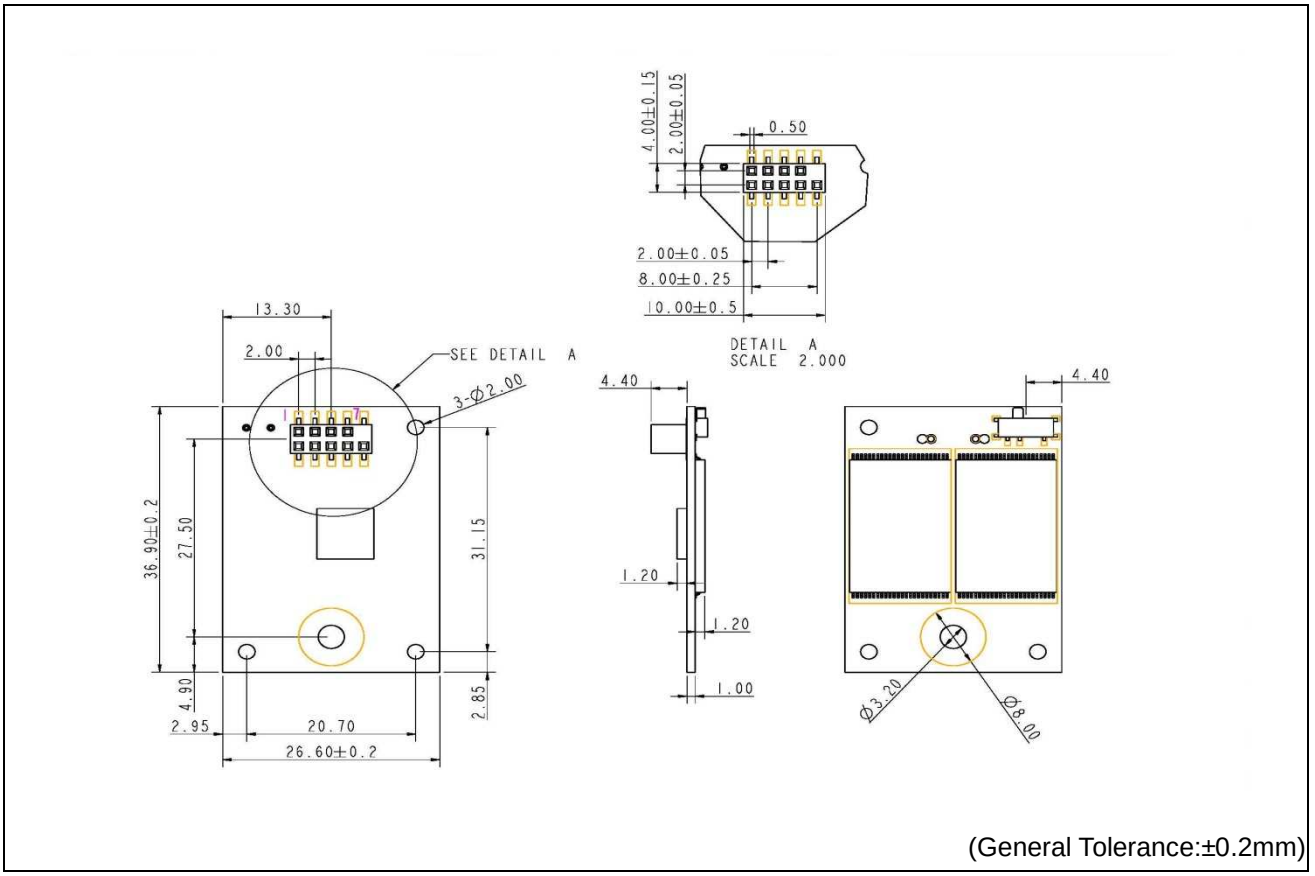
3.5 Mechanical Dimensions

Pin Pitch: 2.54mm (Switch is for option)



(General Tolerance:±0.2mm)

Pin Pitch: 2.00mm (Switch is for option)



(General Tolerance:±0.2mm)

Figure 3: USB EDC Horizontal 2ME mechanical dimensions

3.6 Weight

5g±2

3.7 Performance

Product name		8GB	16GB	32GB	64GB	128GB
USB EDC Horizontal 2ME (Max.)	Sequential Read	23 MB/S	23 MB/S	23 MB/S	23 MB/S	23 MB/S
	Sequential Write	11 MB/S	13 MB/S	17 MB/S	17 MB/S	17 MB/S

3.8 NAND Flash Memory

USB EDC Horizontal 2ME uses Multi Level Cell (MLC) NAND flash memory, which is non-volatility and high reliability.

4. Electrical Specifications

4.1 Power Requirement

Item	Symbol	Rating	Unit
Input voltage	V_{IN}	+5 DC +- 5%	V

Table 5: USB EDC Horizontal 2ME Power Requirement

4.2 Power Consumption

Mode	Power Consumption
Read	165 mA (max.)
Write	145 mA (max.)
Idle	90 mA (max.)
The power consumption is based on 32GB model.	

Table 6: USB EDC Horizontal 2ME Power Consumption

4.3 Device Parameters

USB EDC device parameters listed in Table 7.

Capacity	LBA	User capacity (MB)
8GB	15818752	7724
16GB	31686656	15472
32GB	63389696	30952
64GB	126844928	61936
128GB	253689856	123872

Table 7: USB EDC Horizontal 2ME Device parameters

5. Part Number Rule

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

Definition	
Code 1st (Disk)	**Code 13th (Flash mode)**
D: Disk	R: Sync. Flash (A19)
	B: Toshiba 15nm
Code 2nd ~ 5th (Form Factor)	**Code 14th (Operation Temperature)**
EUH1: USB EDC(Pin pitch 2.54mm) EUH2: USB EDC(Pin pitch 2.00mm)	C: Standard Grade (0℃~ +70℃)
Code 7th ~9th (Capacity)	W: Industrial Grade (-40℃~+85℃)
04G: 4GB	**Code 15th (PCB Version)**
08G: 8GB	1: First Version
16G: 16GB	**Code 16th (Channel)**
32G: 32GB	S: Single
64G: 64GB	**Code 17th (Flash)**
A28: 128GB	
Code 10th ~12th (Category)	C: Toshiba MLC
I72: USB Series	**Code 19th ~ 21st (Customized code)**

宜鼎國際股份有限公司
Innodisk Corporation

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REACH Declaration of Conformity

Manufacturer Product: All Innodisk EM Flash and Dram products

1.宜鼎國際股份有限公司（以下稱本公司）特此保證此售予貴公司之產品，皆符合歐盟化學品法案(Registration , Evaluation and Authorization of Chemicals：REACH)之規定(http://www.echa.europa.eu/de/candidate-list-table **last updated: 16/05/2014**)。所提供之產品包含：(1) 產品或產品所使用到的所有原物料；(2)包裝材料；(3)設計、生產及重工過程中所使用到的所有原物料。

We Innodisk Corporation hereby declare that our products are in compliance with the requirements according to the REACH Regulation (http://www.echa.europa.eu/de/candidate-list-table **last updated: 16/06/2014**). Products include： 1) Product and raw material used by the product； 2) Packaging material ；3) Raw material used in the process of design, production and rework

2.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.

立 保 證 書 人 (Guarantor)

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 李鎧亮

Company Representative Title 公司代表人職稱： CEO 執行長

Date 日期： 2014 / 07 / 29

(Company Stamp/公司大小章)

宜鼎國際股份有限公司
Innodisk Corporation
Tel:(02)7703-3000 Fax:(02) 7703-3555 Internet: http://www.innodisk.com/

RoHS 自我宣告書(RoHS Declaration of Conformity)

Manufacturer Product: All Innodisk EM Flash and Dram products

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 2011/65/EU 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 (2011/65/EU) 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） Polybrominated Biphenyls（PBB）	< 1000 ppm < 1000 ppm

立 保 證 書 人 (Guarantor)

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 李綉茶

Company Representative Title 公司代表人職稱： CEO 執行長

Date 日期： 2014 / 07 / 29

(Company Stamp/公司大小章)

Verification of Compliance

Product Name	:	**USB EDC Horizontal 2ME/2SE**
Model Number	:	**DEUH1(2)-XXXI72#%※&＊** **XXX：512MB~64GB** **#：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	:	**S1O22-U070-1302-273**
Issue Date	:	**May 6, 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: May 6, 2013

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Product Name	:	**USB EDC Horizontal 2ME/2SE**
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Report Number	:	**F-U070-1302-273**
Issue Date	:	**May 6, 2013**
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

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Date: May 6, 2013