USB EDC Vertical 3SE

Customer:

Customer
Part Number:

Innodisk
Part Number:

Innodisk
Model Name:

Date:

Innodisk Approver	Customer Approver

The Total Solution For
Industrial Flash Storage

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REVISION HISTORY

Revision	Description	Date
Preliminary	First Release	Sep, 2014
1.0	Modify TBW based on NAND Flash specifications	Feb, 2015

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1. Product Overview

1.1 Introduction of USB EDC

The Innodisk USB EDC products provide high capacity USB flash memory storage that electrically complies with High-speed USB 3.0 interface. The device features attractive small form factor and the connectivity over USB3.0 and the NAND flash architecture provide a faster data transmission.
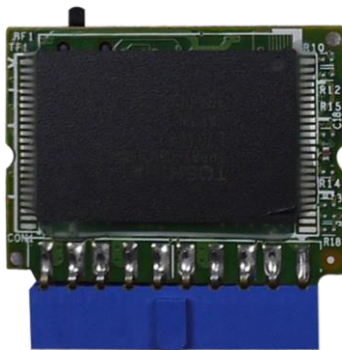
1.2 Product View

Figure 1: USB EDC Vertical 3SE

1.3 Product Models

USB EDC Vertical 3SE is available in follow capacities.
- USB EDC Vertical 3SE 4GB
- USB EDC Vertical 3SE 8GB
- USB EDC Vertical 3SE 16GB
- USB EDC Vertical 3SE 32GB

1.4 Capacity

USB EDC Vertical 3SE provides unformatted from 4GB up to 32GB capacities within SLC Flash IC.

2. Theory of operation

2.1 Overview

Figure 2 shows the operation of USB EDC Vertical 3SE from the system level, including the major hardware blocks.
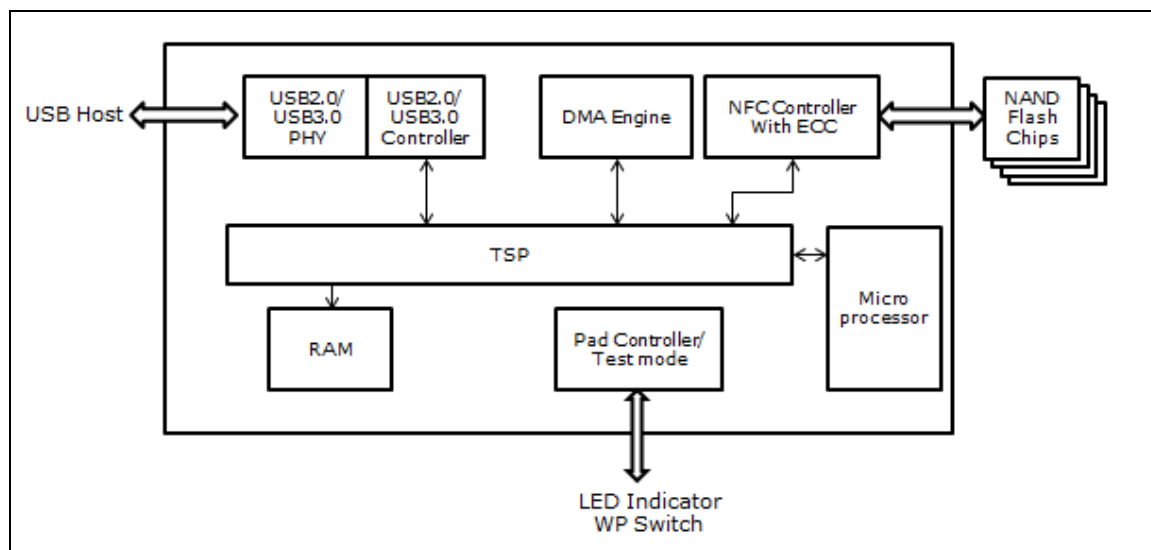

Figure 2: USB EDC Vertical 3SE Block Diagram

USB EDC Vertical 3SE integrates a USB3.0 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 60 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 Vertical 3SE 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 Vertical 3SE conforms to CE and FCC requirements.

3.2 RoHS Compliance

USB EDC Vertical 3SE 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 EDC Vertical 3SE

3.3.4 Mean Time between Failures (MTBF)

Table 2 summarizes the MTBF prediction results for various USB EDC 3SE 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 3SE	Telcordia SR-332 GB, 25°C	>3,000,000

Table 2: USB EDC Vertical 3SE MTBF

3.3.5 Terabyte Written (TBW)

Parameter	Value
TBW(Sequential Write)	
4GB	216
8GB	432
16GB	864
32GB	1728

Table 3: USB EDC Vertical 3SE TBW

3.4 Pin Assignment

USB Drive Vertical 3SE is designed within USB3.0 Interface. Particularly, its built-in power pin enables the device more compactable. Table 4 demonstrates USB EDC Vertical 3SE pin assignments.

Vertical Type			
Pin No.	Signal	Pin No.	Signal
20	No Pin	1	Power
19	Power	2	USB3.0 TXN
18	NC	3	USB3.0 TXP
17	NC	4	GND
16	GND	5	USB3.0 RXN
15	NC	6	USB3.0 RXP
14	NC	7	GND
13	GND	8	USB2.0 DM
12	NC	9	USB2.0 DP
11	NC	10	GND

Table 4: USB EDC 3SE Vertical Pin Assignment

3.5 Mechanical Dimensions
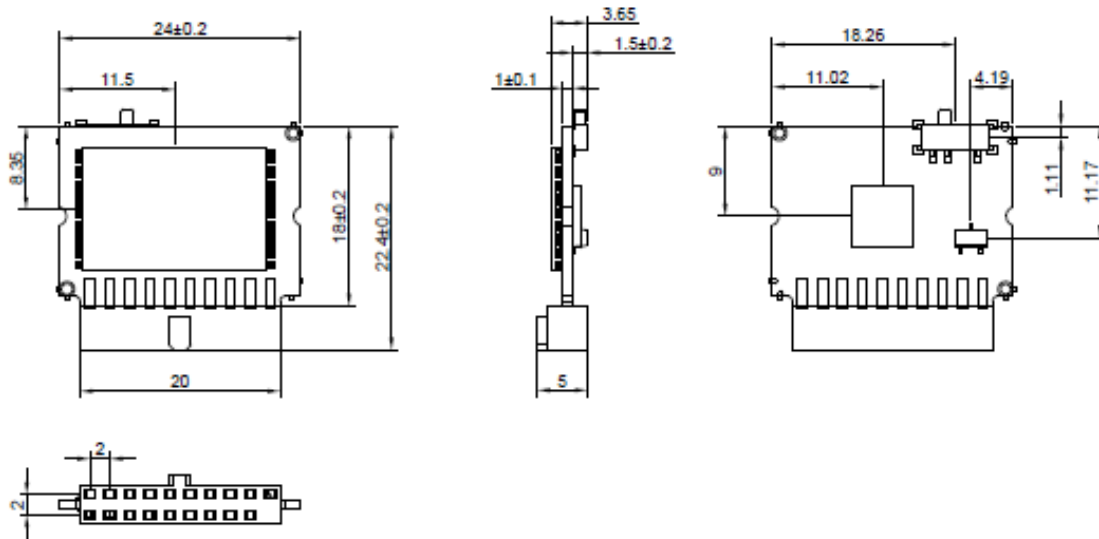
Figure 3:USB EDC Vertical 3SE mechanical dimensions

3.6 Weight

2.5g

3.7 Performance

Product name		4GB	8GB	16GB	32GB
USB EDC Vertical 3SE	Sequential Read (Max.)	100 MB/S	110 MB/S	110 MB/S	110 MB/S
	Sequential Write (Max.)	65 MB/S	80 MB/S	85 MB/S	85 MB/S

3.8 NAND Flash Memory

USB EDC Vertical 3SE uses Single Level Cell (SLC) 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 Vertical 3SE Power Requirement

4.2 Power Consumption

Mode	Power Consumption (mA)
Read	130 (max.)
Write	158 (max.)
Idle	67 (max.)

Table 6: Power Consumption

4.3 Device Parameters

Capacity	LBA	User capacity
4GB	8105984	3958MB
8GB	16211968	7916MB
16GB	32473088	15856MB
32GB	64962560	31720MB

Table 7: 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	V	1	-	0	8	G	I	6	1	S	C	A	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℃)
EUV1: USB EDC Vertical	**Code 15ᵗʰ (Internal control)**
Code 7ᵗʰ ~9ᵗʰ (Capacity)	A~Z: BGA PCB version.
04G: 4GB	
08G: 8GB	**Code 16ᵗʰ (Channel)**
16G: 16GB	S: Single
32G: 32GB	
Code 10ᵗʰ ~12ᵗʰ (Category)	**Code 17ᵗʰ (Flash)**
I61: USB 3SE series	B: Toshiba SLC
Code 13ᵗʰ (Flash mode)	
S: Sync. Flash	

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）特此保證售于貴公司之所有產品，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）	＜ 1000 ppm
Polybrominated Biphenyls（PBB）	＜ 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 李總亮

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

Date 日期： 2014 / 07 / 29
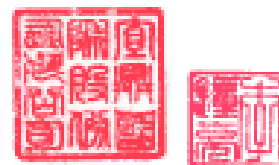
(Company Samp/公司大小章)

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: 16/06/2014)。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。

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Company Representative 公司代表人： Richard Lee 李鐘亮

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)

Certificate

Issue Date: August 26, 2014
Ref. Report No. ISL-14LE364FB

Product Name : USB EDC 3SE/3ME
Model(s) : D@UV1-XXXI61*#%※&
Brand : Innodisk
Applicant : Innodisk Corporation
Address : 5F.No.237, Sec. 1, Datong Rd., Xizhi Dist., New Taipei City 221,
Taiwan (R.O.C.)

We, **International Standards Laboratory**, hereby certify that:

The device bearing the trade name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified. (refer to Test Report if any modifications were made for compliance).
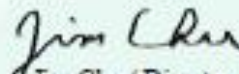
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Standards:

FCC CFR Title 47 Part 15 Subpart B: 2012- Section 15.107 and 15.109
ANSI C63.4-2009
Industry Canada Interference-Causing Equipment Standard ICES-003 Issue 5: 2012

Class B

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

International Standards Laboratory

Jim Chu / Director

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NVLAP

Certificate

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