

USB EDC Vertical 3ME

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
Pre.	First Release	Sep, 2014

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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

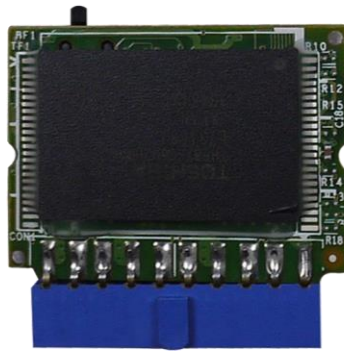


Figure 1: USB EDC Vertical 3ME

1.3 Product Models

USB EDC Vertical 3ME is available in follow capacities.

- USB EDC Vertical 3ME 4GB
- USB EDC Vertical 3ME 8GB
- USB EDC Vertical 3ME 16GB
- USB EDC Vertical 3ME 32GB

1.4 Capacity

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

2. Theory of operation

2.1 Overview

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

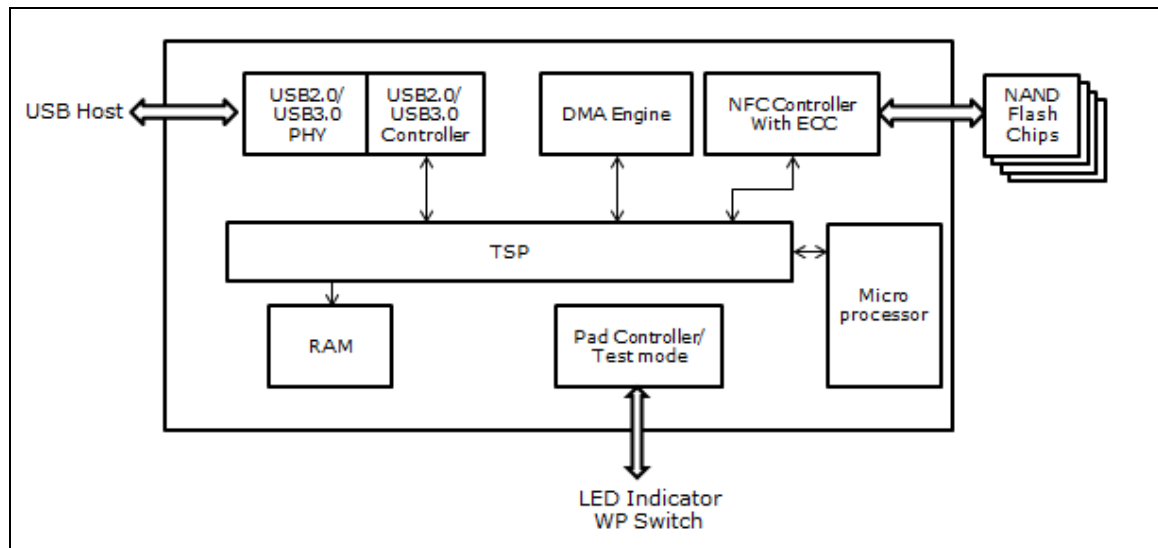


Figure 2: USB EDC Vertical 3ME Block Diagram

USB EDC Vertical 3ME 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 3ME 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 3ME conforms to CE and FCC requirements.

3.2 RoHS Compliance

USB EDC Vertical 3ME 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 3ME

3.3.4 Mean Time between Failures (MTBF)

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

Table 2: USB EDC Vertical 3ME MTBF

3.3.5 Terabyte Written (TBW)

Parameter	Value
Flash Endurance	3,000 P/E cycles
TBW(Sequential Write)	
4GB	10.8
8GB	21.6
16GB	43.2
32GB	86.4

Table 3: USB EDC Vertical 3ME TBW

3.4 Pin Assignment

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

3.5 Mechanical Dimensions

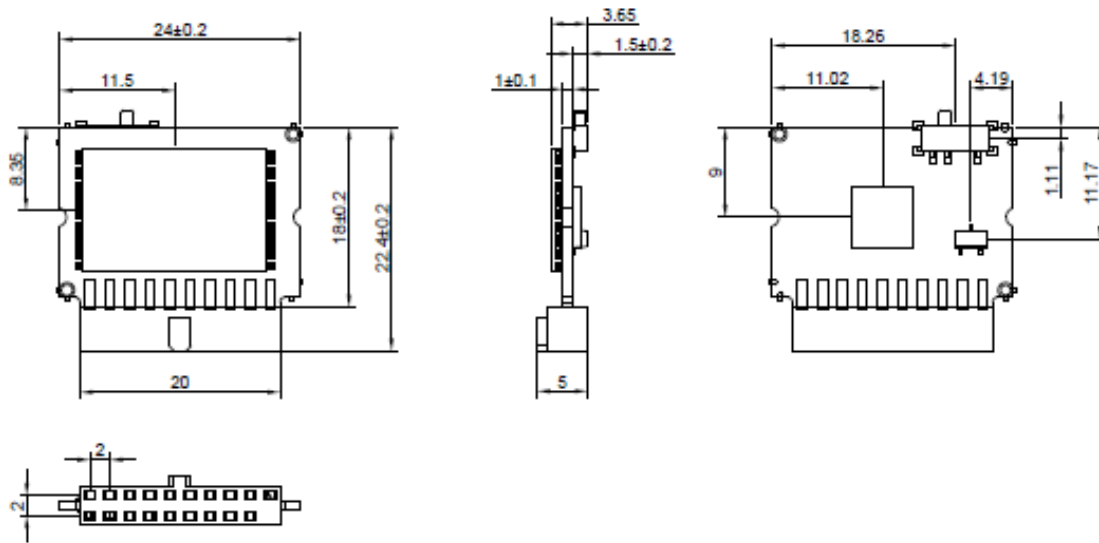


Figure 3:USB EDC Vertical 3ME MECHANICAL DIMENSION

3.6 Weight

2.5g

3.7 Performance

Product name		4GB	8GB	16GB	32GB
USB EDC Vertical 3ME	Sequential Read (Max.)	100 MB/S	95 MB/S	95 MB/S	100 MB/S
	Sequential Write (Max.)	12 MB/S	25 MB/S	45 MB/S	47 MB/S

3.8 NAND Flash Memory

USB EDC Vertical 3ME uses Multi Level Cell (MLC) NAND flash memory, which is non-volatility, high reliability which has 3,000 program/erase times and high speed memory storage.

4. Electrical Specifications

4.1 Power Requirement

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

Table 5: USB EDC Vertical 3ME Power Requirement

4.2 Power Consumption

Mode	Power Consumption (mA)
Read	122 (max.)
Write	141 (max.)
Idle	64 (max.)

Table 6: Power Consumption

4.3 Device Parameters

Capacity	LBA	User capacity
4GB	7905280	3860MB
8GB	15810560	7720MB
16GB	31653888	15456MB
32GB	63373312	30944MB

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	R	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 14th (Operation Temperature)										
D: Disk										C: Standard Grade (0°C ~ +70°C)										
Code 2nd ~ 5th (Form Factor)										W: Industrial Grade (-40°C ~ +85°C)										
EUV1: USB EDC Vertical										Code 15th (Internal control)										
Code 7th ~9th (Capacity)										1~9: TSOP PCB version.										
04G: 4GB																				
08G: 8GB										Code 16th (Channel)										
16G: 16GB										S: Single										
32G: 32GB																				
Code 10th ~12th (Category)										Code 17th (Flash)										
I61: USB 3ME series										C: Toshiba MLC										
Code 13th (Flash mode)																				
R: 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)	< 1000 ppm
Polybrominated Biphenyls (PBB)	< 1000 ppm

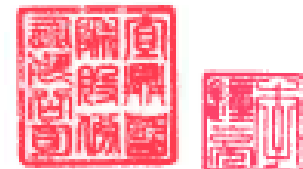
立 保 證 書 人 (Guarantor)

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 蔡鍾亮

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

Date 日期：2014 / 07 / 29



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