# Table of contents

**REVISION HISTORY** .......................................................................................................................... 3

1. Introduction ........................................................................................................................................ 6

2. Features .............................................................................................................................................. 6

3. Pin Assignment .................................................................................................................................. 8

4. Specifications ...................................................................................................................................... 8

   4.1 CE and FCC Compatibility ........................................................................................................... 8

   4.2 RoHS Compliance ......................................................................................................................... 8

   4.3 Reliability ......................................................................................................................................... 8

5. Environmental Specifications ............................................................................................................. 9

   5.1 Temperature Ranges ..................................................................................................................... 9

   5.2 Humidity ......................................................................................................................................... 9

   5.3 Shock and Vibration ....................................................................................................................... 9

   5.4 Mean Time between Failures (MTBF) .......................................................................................... 9

   5.5 Mechanical Dimensions ............................................................................................................... 10

   5.6 Electrical Specifications ............................................................................................................... 10

      5.6.1 Absolute Maximum Ratings ............................................................................................... 10

      5.6.2 Operating Conditions ............................................................................................................ 10

6. i-S.M.A.R.T Utility ............................................................................................................................. 11

7. Part Number Rule ............................................................................................................................... 13
# REVISION HISTORY

<table>
<thead>
<tr>
<th>Revision</th>
<th>Description</th>
<th>Date</th>
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<td>First Release</td>
<td>2012/11/14</td>
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<tr>
<td>Rev 1.0</td>
<td>Add CE/FCC Report</td>
<td>2013/4/15</td>
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<tr>
<td>Rev 1.1</td>
<td>Modify Appearance of Industrial nanoUSB</td>
<td>2013/9/12</td>
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<tr>
<td>Rev. 1.2</td>
<td>Modify PN rule</td>
<td>2016/2/4</td>
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<tr>
<td>Rev. 1.3</td>
<td>Add TBW</td>
<td>2016/10/11</td>
</tr>
<tr>
<td>Rev. 1.4</td>
<td>Modify Part Number rule</td>
<td>2016/10/14</td>
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List of Tables

Table 1: Industrial nanoUSB Pin Assignments ................................................................. 8
Table 2: Shock/Vibration Testing for Industrial nanoUSB .................................................. 9
Table 3: Industrial nanoUSB MTBF .............................................................................. 9
Table 4: Industrial nanoUSB .......................................................................................... 10
Table 5: Industrial nanoUSB Operating Conditions ......................................................... 10
List of Figures

Figure 1: Appearance of Industrial nanoUSB .............................................................. 6
Figure 2: Mechanical Dimension of Industrial nanoUSB ........................................... 10
Figure 3: User Interface of i-S.M.A.R.T Utility ......................................................... 11
1. Introduction

The Innodisk Industrial nanoUSB is the smallest industrial USB storage in the world. It electrically complies with High-speed USB 2.0 interface & backward compatible with USB 1.1. In order to fulfill the industrial applications, Industrial nanoUSB is embedded with SLC NAND flash. Moreover, it features enhanced power cycling which ensures data integrity in flash when abnormal power failure happens.

The Industrial nanoUSB offers following key features which make it more reliable, such as being ESD resistant to 8KV (contact discharge) and 15KV (air discharge). At the same time, it also features a wide operating temperature range from -40°C to 85°C, making it well-suited for industrial control applications in a variety of different rugged operating conditions. Also, the health of Industrial nanoUSB can be monitored by a specific i-S.M.A.R.T utility.

![Figure 1: Appearance of Industrial nanoUSB](image)

2. Features

The Industrial nanoUSB provides following features:

- NAND flash type: SLC
- Capacities: 1GB, 2GB, 4GB, 8GB
- High-speed USB 2.0 interface; backward compatible with USB 1.1
- BCH ECC: 16bits/1KBytes
- High performance (Sequential Read/Write, Max, MB/sec):
  - 4GB/8GB: 19/17
  - 2GB: 18/15
  - 1GB: 18/13
- Customized PID/VID (specify 4bits for each ID, Hexadecimal(0~F))
  - Ex: PID: 182C; VID: 019F
- Global Wear-leveling supported
- Power supply: 5V DC ± 5%
- Low power consumption (Max.):
- Read: 90mA  
- Write: 90mA  
- Idle: 60mA

- ESD Proof:  
  - Air Discharge: 15KV  
  - Contact Discharge: 8KV

- Temperature range:  
  - Operating:  
    - 0°C ~ 70°C (Standard grade)  
    - -40°C ~ +80°C (Industrial grade)  
  - Storage: -55°C ~ +95°C

- Humidity: 10-95%, non-condensing

- Environmental reliability:  
  - Vibration: 7 Hz to 2K Hz, 5G, 3 axes  
  - Shock: Duration: 0.5ms, 50G, 3 axes

- Dimension (W x L x H): 15.4 x 19.4 x 6.9 (±0.2mm)

- Certification: CE, FCC, RoHS

- Weight: 2.6g
3. Pin Assignment

Please refer to Table 1 for Industrial nanoUSB pin assignments.

Table 1: Industrial nanoUSB Pin Assignments

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VBUS</td>
<td>+5V</td>
</tr>
<tr>
<td>2</td>
<td>D-</td>
<td>Data -</td>
</tr>
<tr>
<td>3</td>
<td>D+</td>
<td>Data +</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>

4. Specifications

4.1 CE and FCC Compatibility

The Innodisk Industrial nanoUSB conforms to CE requirements and FCC standards.

4.2 RoHS Compliance

The Innodisk Industrial nanoUSB is fully compliant with RoHS directive.

4.3 Reliability

Table 2: Industrial nanoUSB TBW

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read Cycles</td>
<td>Unlimited Read Cycles</td>
</tr>
<tr>
<td>Flash Endurance</td>
<td>60,000 P/E cycles</td>
</tr>
<tr>
<td>Wear-Leveling Algorithm</td>
<td>Support</td>
</tr>
<tr>
<td>Bad Blocks Management</td>
<td>Support</td>
</tr>
<tr>
<td>Error Correct Code</td>
<td>Support</td>
</tr>
<tr>
<td>TBW(Sequential Write)</td>
<td>Unit: TB</td>
</tr>
<tr>
<td>1GB</td>
<td>32.4</td>
</tr>
<tr>
<td>2GB</td>
<td>64.8</td>
</tr>
<tr>
<td>4GB</td>
<td>129.6</td>
</tr>
<tr>
<td>8GB</td>
<td>259.2</td>
</tr>
</tbody>
</table>
5. Environmental Specifications

5.1 Temperature Ranges

- Operating Temperature Range:
  - 0°C ~ +70°C (Standard grade)
  - -40°C ~ +85°C (Industrial grade)
- Storage Temperature Range: -55°C to +95°C

5.2 Humidity

Relative Humidity: 10-95%, non-condensing.

5.3 Shock and Vibration

Table 3: Shock/Vibration Testing for Industrial nanoUSB

<table>
<thead>
<tr>
<th>Reliability</th>
<th>Test Conditions</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibration</td>
<td>7 Hz to 2000 Hz, 5G, 3 axes</td>
<td>IEC 68-2-6</td>
</tr>
<tr>
<td>Shock</td>
<td>Duration: 0.5ms, 50G, 3 axes</td>
<td>IEC 68-2-27</td>
</tr>
</tbody>
</table>

5.4 Mean Time between Failures (MTBF)

Table 3 summarizes the MTBF prediction results for various Industrial nanoUSB 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.

Table 4: Industrial nanoUSB MTBF

<table>
<thead>
<tr>
<th>Product</th>
<th>Condition</th>
<th>MTBF (Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial nanoUSB</td>
<td>Telcordia SR-332 GB, 25°C</td>
<td>3,000,000</td>
</tr>
</tbody>
</table>
5.5 Mechanical Dimensions

- Dimension (W x L x H): 15.4 x 19.4 x 6.9 (±0.2mm)

![Mechanical Dimension of Industrial nanoUSB](image)

5.6 Electrical Specifications

5.6.1 Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Temperature</td>
<td>TStor</td>
<td>-55 ~ +95°C</td>
<td>°C</td>
</tr>
<tr>
<td>Ambient Operating Temperature</td>
<td>Ta</td>
<td>0 ~ +70°C</td>
<td>°C</td>
</tr>
<tr>
<td>3.3V supply voltage</td>
<td>VCC33</td>
<td>-0.3 ~ 3.6V</td>
<td>V</td>
</tr>
<tr>
<td>1.8V supply voltage</td>
<td>VCC18</td>
<td>-0.3 ~ 2V</td>
<td>V</td>
</tr>
<tr>
<td>3.3V buffer input voltage</td>
<td>Vin33</td>
<td>-0.3 ~ 3.6V</td>
<td>V</td>
</tr>
<tr>
<td>3.3V/5V buffer input voltage</td>
<td>Vin335</td>
<td>-0.3 ~ 5V</td>
<td>V</td>
</tr>
<tr>
<td>1.8V buffer input voltage</td>
<td>Vin18</td>
<td>-0.3 ~ 2V</td>
<td>V</td>
</tr>
</tbody>
</table>

5.6.2 Operating Conditions

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB 5V supply voltage</td>
<td>USBVin</td>
<td>3.2 ~ 5.5V</td>
<td>V</td>
</tr>
<tr>
<td>3.3V supply voltage</td>
<td>VDD33</td>
<td>3.0 ~ 3.6V</td>
<td>V</td>
</tr>
<tr>
<td>1.8V supply voltage</td>
<td>VDD18</td>
<td>1.6 ~ 2V</td>
<td>V</td>
</tr>
</tbody>
</table>
6. **i-S.M.A.R.T Utility**

The health of Industrial nanoUSB can be monitored by a specific i-S.M.A.R.T utility as below:

![User Interface of i-S.M.A.R.T Utility](figure3.png)

**Figure 3: User Interface of i-S.M.A.R.T Utility**

Detailed Description for SMART Information:

- **Average Erase Count**
  
  Value: To record average erase ratio. This value is calculated by “total erase counts”, “Flash P/E cycles”, “Flash total blocks”.
  
  Initial value = 00.00%
  
  Maximum value = 100.00%

- **Abnormal Shutdown Count**
  
  Value: To record abnormal shutdown condition. Increasing this value by 1 when detected error in the power on stage.
  
  Initial value = 0.
  
  Maximum value = 4294967295.

- **Power Cycle Count**
  
  Value: To record power cycle condition. Increasing this value by 1 when a power Cycle (both normal and abnormal) occurred.
  
  Initial value = 0.
  
  Maximum value = 4294967295.

- **Spare Block Count**
Value: To record spare block counts. Decreasing this variable when detected run-time bad blocks. (note: run-time bad blocks may be “erase error”, “program error”, “read error”.)
Initial value = depends on Flash.
Maximum value = 255.
Minimum value = 0.

- **ECC Uncorrectable Count**
  Value: To record ECC uncorrectable block counts. Increase this value by 1 when fatal error occurred in Flash read operation.
  Initial value = 0.
  Maximum value = 255.

- **Flash Type**
  Value: To determinate mounted Flash type, and always keep in original value.
  
  0: SLC, 1: MLC.
  
  Initial value = depends on Flash.

- **Initial Bad Block Count**
  Value: To record initial bad blocks when MP process, and always keep in original value.
  Initial value = depends on Flash.
  Maximum value = 65535.

- **Later Bad Block Count**
  Value: To record run time bad blocks. Increasing this variable when detected run-time bad blocks.
  Initial value = 0.
  Maximum value = 65535.
7. Part Number Rule

<table>
<thead>
<tr>
<th>Part Number</th>
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<th>4</th>
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<th>8</th>
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<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Disk</td>
<td>Industrial nanoUSB</td>
<td>-</td>
<td>Capacity</td>
<td>Category</td>
<td>Internal control</td>
<td>Operation Temp.</td>
<td>Internal Control</td>
<td>Channel</td>
<td>Flash</td>
<td>Customized Code</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code 1st (Disk)</td>
<td>D: Disk</td>
<td>Code 12th (Internal control)</td>
<td>Code 13th (Operation Temperature)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Code 2nd ~ 4th (Form Factor)</td>
<td>Code 6th ~ 8th (Capacity)</td>
<td>Code 14th (Internal Control)</td>
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</tr>
<tr>
<td>Code 9th ~11th (Category)</td>
<td>Code 15th (Channel)</td>
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<td></td>
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<tr>
<td>Code 16th (Flash)</td>
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<td></td>
</tr>
</tbody>
</table>

- **D**: Disk  
- **E**: Toshiba SLC (1GB)  
- **U**: Micron SLC (2/4/8GB)  
- **N**: Standard Grade (0°C ~ +70°C)  
- **W**: Industrial Grade (-40°C ~ +85°C)  
- **S**: Single  
- **G**: Toshiba SLC (1GB)  
- **A**: Micron SLC (2/4/8GB)  
- **T**: Toshiba SLC (1GB)  
- **B**: Micron SLC (2/4/8GB)  
- **0**: 1GB  
- **8**: 2GB  
- **4**: 4GB  
- **2**: 8GB  
- **01G**: 1GB  
- **02G**: 2GB  
- **04G**: 4GB  
- **08G**: 8GB  
- **S24**: Industrial nanoUSB
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。

Innolink 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，雙方同意友好協商，達成協議。

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

<table>
<thead>
<tr>
<th>Name of hazardous substance</th>
<th>Limited of RoHS</th>
<th>ppm (mg/kg)</th>
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</thead>
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<td>Cd</td>
<td>&lt; 100 ppm</td>
<td></td>
</tr>
<tr>
<td>Pb</td>
<td>&lt; 1000 ppm</td>
<td></td>
</tr>
<tr>
<td>Hg</td>
<td>&lt; 1000 ppm</td>
<td></td>
</tr>
<tr>
<td>Chromium VI (Cr+6)</td>
<td>&lt; 1000 ppm</td>
<td></td>
</tr>
<tr>
<td>Polybromodiphenyl ether (PBDE)</td>
<td>&lt; 1000 ppm</td>
<td></td>
</tr>
<tr>
<td>Polybrominated Biphenyls (PBB)</td>
<td>&lt; 1000 ppm</td>
<td></td>
</tr>
</tbody>
</table>

立 保 證 書 人 (Guarantor)

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

Company Representative 公司代表人： Richard Lee 李鍾亮

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

Date 日期： 2014 / 07 / 29

(Company Seal/公司印章)
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）特此保證售予貴公司之產品，皆符合歐盟化學品法令 (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、生產及重製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 李鎮傑

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

Date 日期： 2014 / 07 / 29
Verification of Compliance

Product Name: Industrial Nano USB
Model Number: DEUN-XXXS23A%1S&
XXX : 01G~08G
% : Operation Temperature (C, W)
& : NAND Flash Type (B, T)
Applicant: InnoDisk Corporation
Address: 9F, No.100, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221, Taiwan
Report Number: O22-U070-1211-300
Issue Date: December 12, 2012
Applicable Standards:
EN 55022:2010 Class B ITE
AS/NZS CISPR22:2009 Class B ITE
EN 55024:2010
EN 61000-4-2:2009
EN 61000-4-4:2004+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.

Central Research Technology Co.
EMC Test Laboratory
11, Lane 41, Fushuen St., Jungshan Chiu,
Taipei, Taiwan, 104, R.O.C.
Tel : 886-2-25984568
Fax: 886-2-25984568

(Taun-Yu ShihV General Manager)
Date: December 12, 2012
Verification of Compliance

Product Name: Industrial Nano USB
Model Number: DEUN-XXS23A%1S&
   XXX : 01G~08G
   % : Operation Temperature (C, W)
   & : NAND Flash Type (B, T)
Applicant: InnoDisk Corporation
Address: 9F, No.100, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221, Taiwan
Report Number: F-U070-1211-300
Issue Date: December 12, 2012
Applicable Standards:
   FCC Part 15, Subpart B Class B ITE
   ANSI C63.4:2003
   Industry Canada ICES-003 Issue 4
   CSA-IEC CISPR22: 02 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.

Central Research Technology Co.
EMC Test Laboratory
11, Lane 41, Fushan St., Jungshan Chiu, Taipei, Taiwan, 104, R.O.C.
Tel: 886-2-25984568
Fax: 886-2-25984549

(Tsun-Yu Shih/ General Manager)
Date: December 12, 2012