



# EMPL-G2S1

## mPCIe to dual isolated GbE LAN Module

|              |  |
|--------------|--|
| Customer:    |  |
| Customer     |  |
| Part Number: |  |
| Innodisk     |  |
| Part Number: |  |
| Innodisk     |  |
| Model Name:  |  |
| Date:        |  |

|                                    |                                    |
|------------------------------------|------------------------------------|
| <b>Innodisk</b><br><b>Approver</b> | <b>Customer</b><br><b>Approver</b> |
|                                    |                                    |

Total Solution For  
Embedded Peripherals

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## REVISION HISTORY

| Revision | Description    | Date      |
|----------|----------------|-----------|
| 1.0      | First Released | Oct, 2022 |

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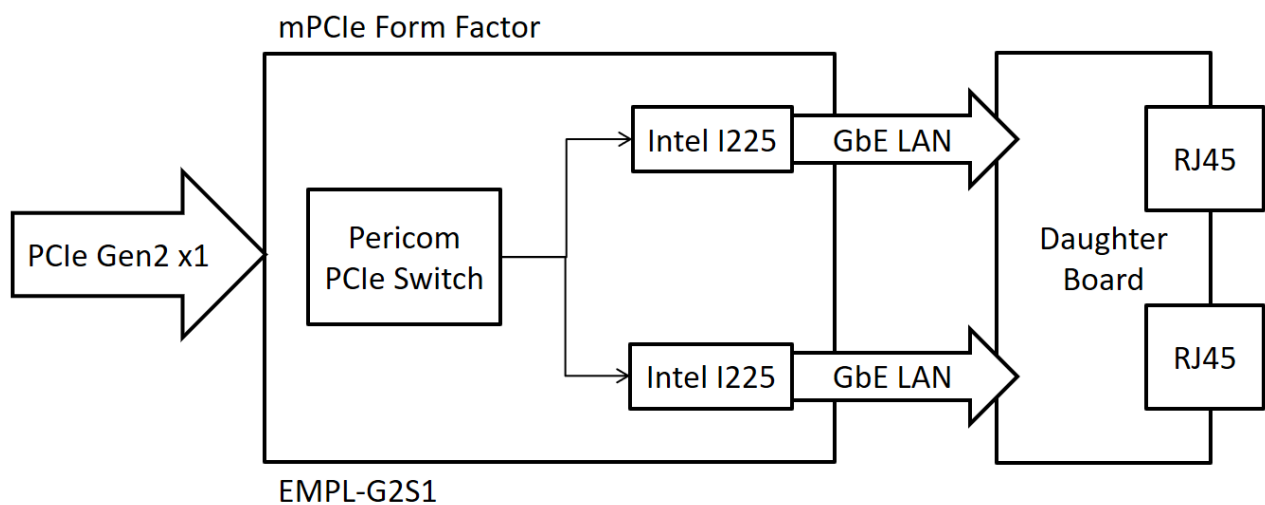
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# 1. Product Introduction

## 1.1. Overview

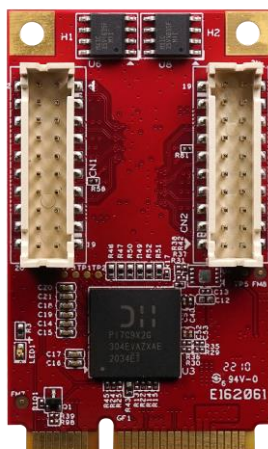
Innodisk EMPL-G2S1 is designed with standard Mini PCI Express form factor, EMPL-G2S1 supports PCIe Gen 2.1 with a single lane to dual independent isolated GbE LAN, optimized for higher performance and lower power, which brings you a flexible expansion solution for embedded systems.



**Figure 1: Block Diagram**

## 1.2. Features

- Dual isolated GbE LAN ports
- Complies with EN61000-4-5 2kV Surge protection
- Complies with IEC 60950-1:2005 + A1: 2009 + A2:2013 2kV HiPOT protection
- Complies with EN61000-4-2 (ESD) Air-15kV, Contact-8kV
- Flexible daughter board with cable to fit into different system
- Optional terminal mounting hole or bracket for daughter board
- Optional Industrial Temperature (-40°C to +85°C) support
- 30μ " golden finger, 3-year warranty
- Industrial design, manufactured in innodisk Taiwan



**Figure 2: mPCIe Board Picture**



**Figure 3: Mounting Hole Daughter Board Picture (EMPL-G2S1-C1/V1/W1)**



**Figure 4: Bracket Daughter Board Picture (EMPL-G2S1-C2/V2/W2)**

## 2. Product Specifications

### 2.1. Device Parameters

**Table 1: Device Parameters**

|                          |                                                                         |
|--------------------------|-------------------------------------------------------------------------|
| <b>Form Factor</b>       | mPCIe                                                                   |
| <b>Input I/F</b>         | PCI Express 2.1 x 1                                                     |
| <b>Output I/F</b>        | Dual GbE LAN                                                            |
| <b>Output Connector</b>  | RJ45 x 2                                                                |
| <b>Dimension (WxLxH)</b> | mPCIe Board: 30 x 50.9 x 9.2 mm<br>Daughter Board: 30 x 59.5 x 17.32 mm |

### 2.2. Electrical Specifications

#### 2.2.1. Power Requirement

**Table 2: Power Requirement**

| Item          | Connector           | Rating       |
|---------------|---------------------|--------------|
| Input voltage | mPCIe Golden Finger | +3.3 DC +-5% |

#### 2.2.2. Power Consumption

**Table 3: Power Consumption**

| Voltage(V) | RMS(mA) | Max (mA) |
|------------|---------|----------|
| 3.3        | 720     | 865      |

### 2.3. Environmental Specifications

#### 2.3.1. Temperature Ranges

**Table 4: Temperature Ranges**

| Temperature | Range                                                           |
|-------------|-----------------------------------------------------------------|
| Operating   | Standard Grade: 0°C to +70°C<br>Industrial Grade: -40°C to +85° |
| Storage     | -55°C to +95°                                                   |

### 2.3.2. Humidity

Relative Humidity: 10-95%, non-condensing

### 2.3.3. Shock and Vibration

**Table 5: 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, 1500 G, 3 axes | IEC 68-2-27         |

### 2.3.4. Mean Time between Failure (MTBF)

Reliability prediction methodology provides the basis for reliability evaluation and analysis. The purpose of the prediction is to predict the life time of the product in units of failure rate and MTBF.

**Table 6: Mean Time between Failure (MTBF)**

| Product            | Condition                                                                                                                                                     | MTBF (Hours) |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| EMPL-G2S1-C1/V1/W1 | The analysis is at 25°C ambient temperature by Telcordia SR-332, Issues 4, Method I, Case 3 under Ground Benign, Controlled environment, 50% operation stress | 11,764,418   |
| EMPL-G2S1-C2/V2/W2 | The analysis is at 25°C ambient temperature by Telcordia SR-332, Issues 4, Method I, Case 3 under Ground Benign, Controlled environment, 50% operation stress | 12,410,341   |

### 2.4. CE and FCC Compatibility

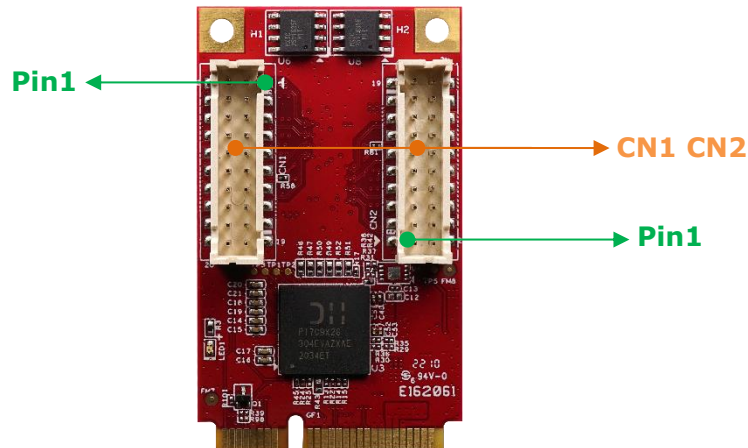
EMPL-G2S1 conforms to CE and FCC requirements.

### 2.5. RoHS Compliance

EMPL-G2S1 is fully compliant with RoHS directive.

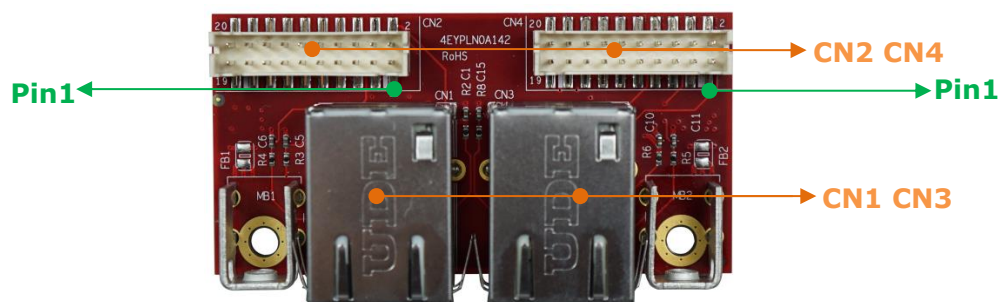
## 2.6. Hardware

### 2.6.1. Layout



**Table 7: mPCIe PCB Layout Legend**

| Label      | Connector Type                                   | Function                                 |
|------------|--------------------------------------------------|------------------------------------------|
| <b>CN1</b> | Wire to board SMD 2*10P 180°<br>P:2.00mm H:4.0mm | GbE LAN Signal<br>10/100/1000 LED Signal |
| <b>CN2</b> | Wire to board SMD 2*10P 180°<br>P:2.00mm H:4.0mm | GbE LAN Signal<br>10/100/1000 LED Signal |



**Table 8: Daughter Board PCB Layout Legend**

| Label      | Connector Type                                                      | Function                                  |
|------------|---------------------------------------------------------------------|-------------------------------------------|
| <b>CN1</b> | 10/100/1000 Base-T RJ45<br>DIP 10P8C 90°<br>LED: Green-Orange/Green | GbE LAN Port<br>10/100/1000 LED Indicator |
| <b>CN2</b> | Wire to board SMD 2*10P 180°<br>P:2.00mm H:4.0mm                    | GbE LAN Signal<br>10/100/1000 LED Signal  |
| <b>CN3</b> | 10/100/1000 Base-T RJ45<br>DIP 10P8C 90°<br>LED: Green-Orange/Green | GbE LAN Port<br>10/100/1000 LED Indicator |
| <b>CN4</b> | Wire to board SMD 2*10P 180°<br>P:2.00mm H:4.0mm                    | GbE LAN Signal<br>10/100/1000 LED Signal  |

### 2.6.2. Pin Define

**Table 9: mPCIe Pin Define**

| Signal Name | Pin #     | Pin #     | Signal Name |
|-------------|-----------|-----------|-------------|
| NC          | <b>51</b> | <b>52</b> | 3.3V AUX    |
| NC          | <b>49</b> | <b>50</b> | GND         |
| NC          | <b>47</b> | <b>48</b> | NC          |
| NC          | <b>45</b> | <b>46</b> | NC          |
| GND         | <b>43</b> | <b>44</b> | NC          |
| 3.3V AUX    | <b>41</b> | <b>42</b> | NC          |
| 3.3V AUX    | <b>39</b> | <b>40</b> | GND         |
| GND         | <b>37</b> | <b>38</b> | NC          |
| GND         | <b>35</b> | <b>36</b> | NC          |
| RX+         | <b>33</b> | <b>34</b> | GND         |
| RX-         | <b>31</b> | <b>32</b> | SMBDATA     |
| GND         | <b>29</b> | <b>30</b> | SMBCLK      |
| GND         | <b>27</b> | <b>28</b> | NC          |
| TX+         | <b>25</b> | <b>26</b> | GND         |
| TX-         | <b>23</b> | <b>24</b> | 3.3V AUX    |
| GND         | <b>21</b> | <b>22</b> | PERST#      |
| NC          | <b>19</b> | <b>20</b> | NC          |
| NC          | <b>17</b> | <b>18</b> | GND         |

|           |    |    |          |
|-----------|----|----|----------|
| GND       | 15 | 16 | NC       |
| CLK+      | 13 | 14 | NC       |
| CLK-      | 11 | 12 | NC       |
| GND       | 9  | 10 | NC       |
| GND       | 7  | 8  | NC       |
| NC        | 5  | 6  | NC       |
| NC        | 3  | 4  | GND      |
| PE_WAKE_N | 1  | 2  | 3.3V AUX |

### 2.6.3. I/O Connector Mechanical Drawing & Pin Defines

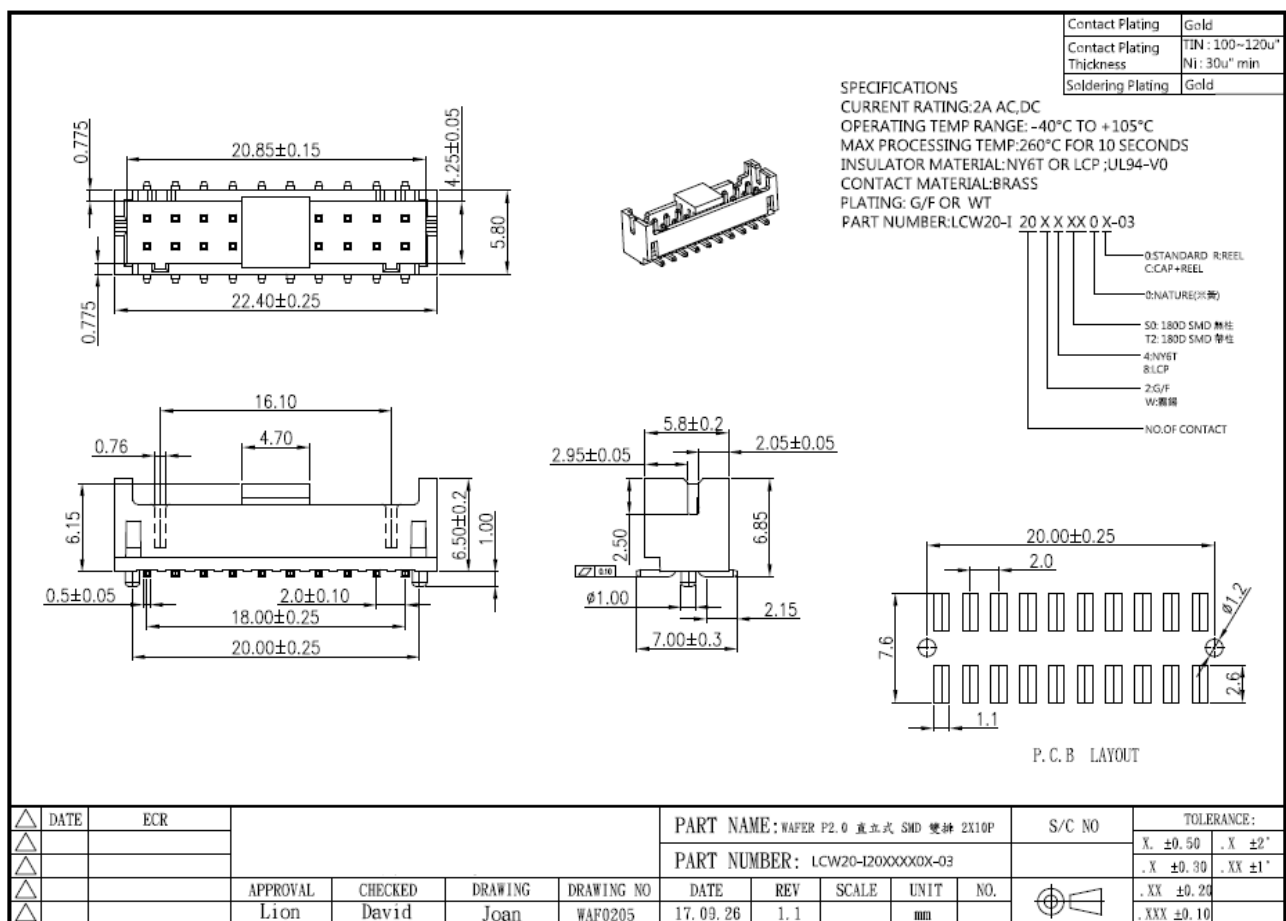
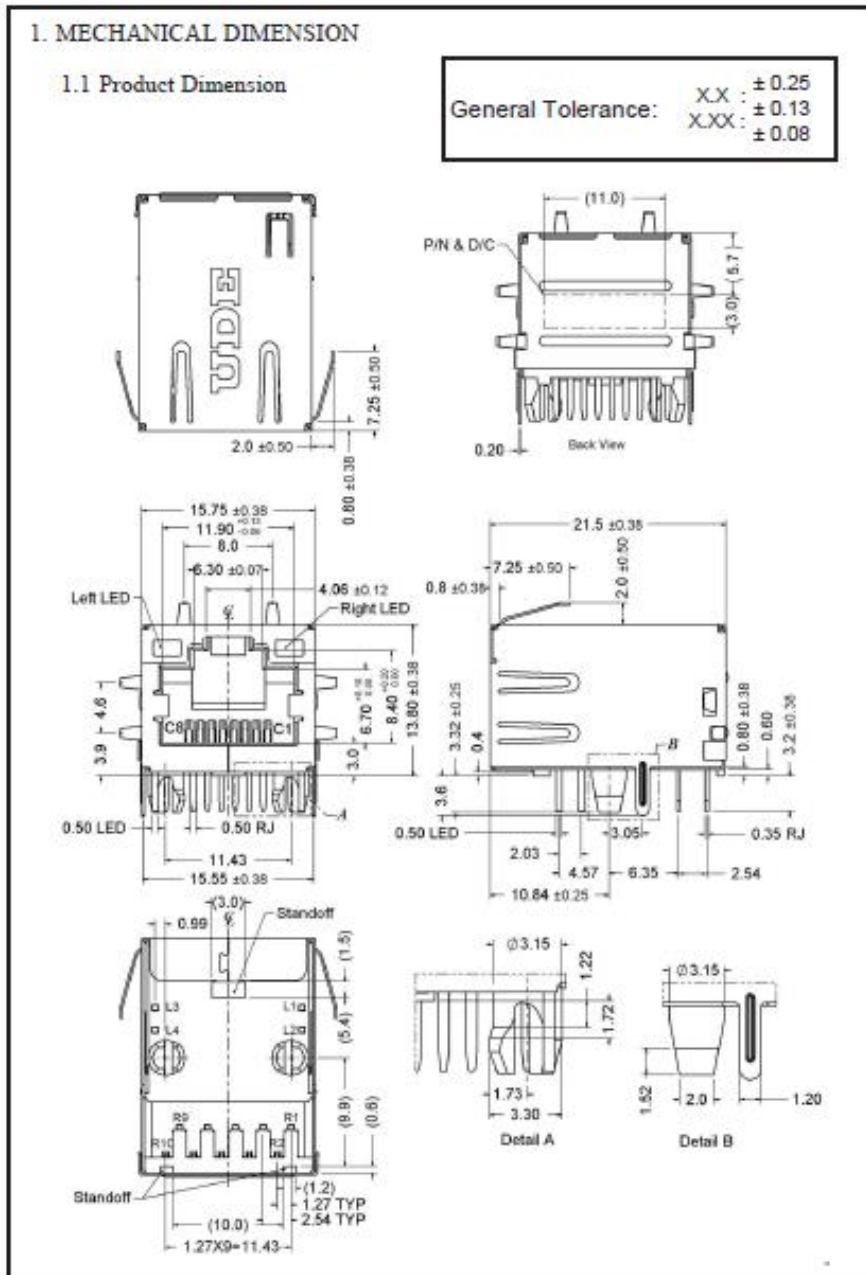


Figure 5: Wire to Board SMD 2\*10P Connector Drawing

**Table 10: Wire to Board SMD 2\*10P Connector Pin Define**

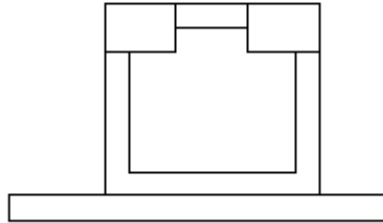
| Signal Name | Pin # | Pin # | Signal Name |
|-------------|-------|-------|-------------|
| LINK_100_N  | 2     | 1     | MDI0P_IC    |
| LINK_ACT_N  | 4     | 3     | MDI0N_IC    |
| LINK_1000_N | 6     | 5     | MDI1P_IC    |
| GND         | 8     | 7     | MDI1N_IC    |
| GND         | 10    | 9     | MDI2P_IC    |
| GND         | 12    | 11    | MDI2N_IC    |
| 3.3V        | 14    | 13    | MDI3P_IC    |
| 3.3V        | 16    | 15    | MDI3N_IC    |
| NC          | 18    | 17    | NC          |
| NC          | 20    | 19    | NC          |



**Figure 6: RJ45 Connector Drawing**

**Table 11: RJ45 LAN LED Table**

Orange  
/Green      Green



| Speed LED         |                |
|-------------------|----------------|
| 10M               | OFF            |
| 100M              | OFF            |
| 1G                | Orange         |
| Link-Activity LED |                |
| Link-up           | Green          |
| Tx/Rx Activity    | Blinking Green |

#### 2.6.4. EMPL-G2S1 Mechanical Drawing

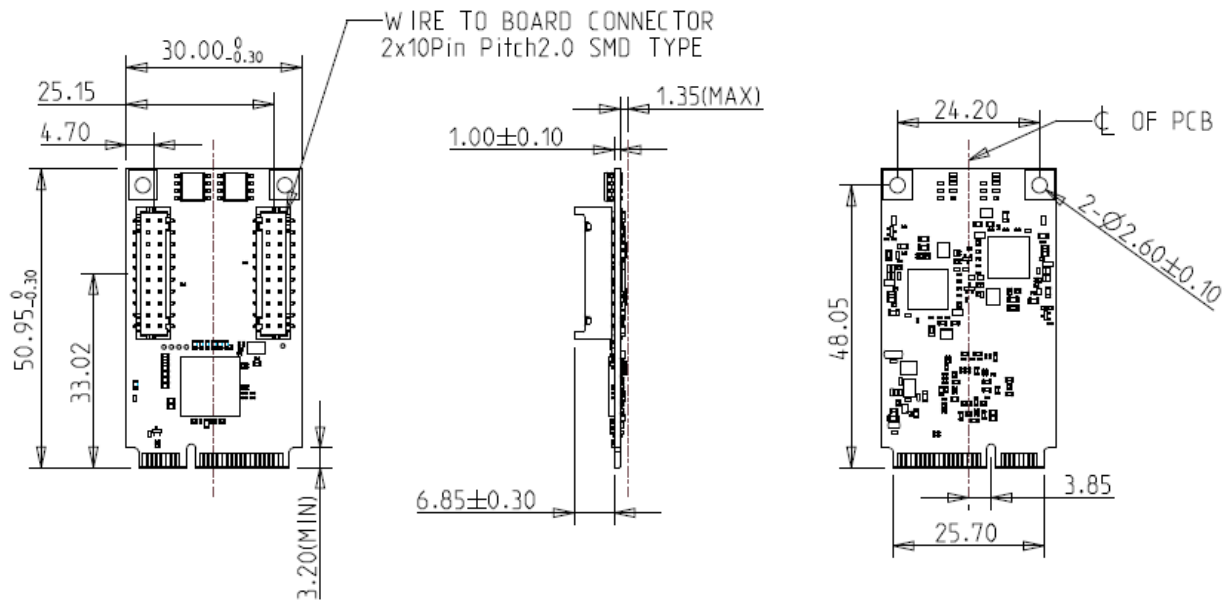


Figure 7: EMPL-G2S1 mPCIe Board Drawing

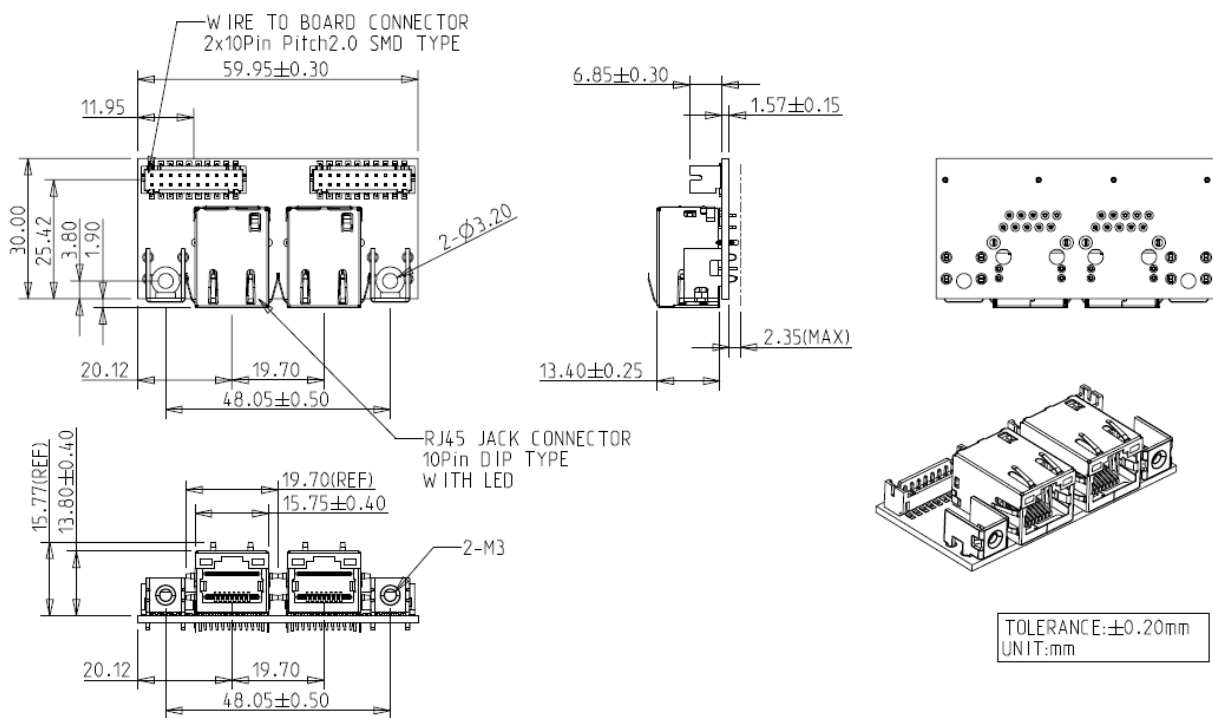


Figure 8: Mounting Hole Daughter Board Drawing (EMPL-G2S1-C1/V1/W1)

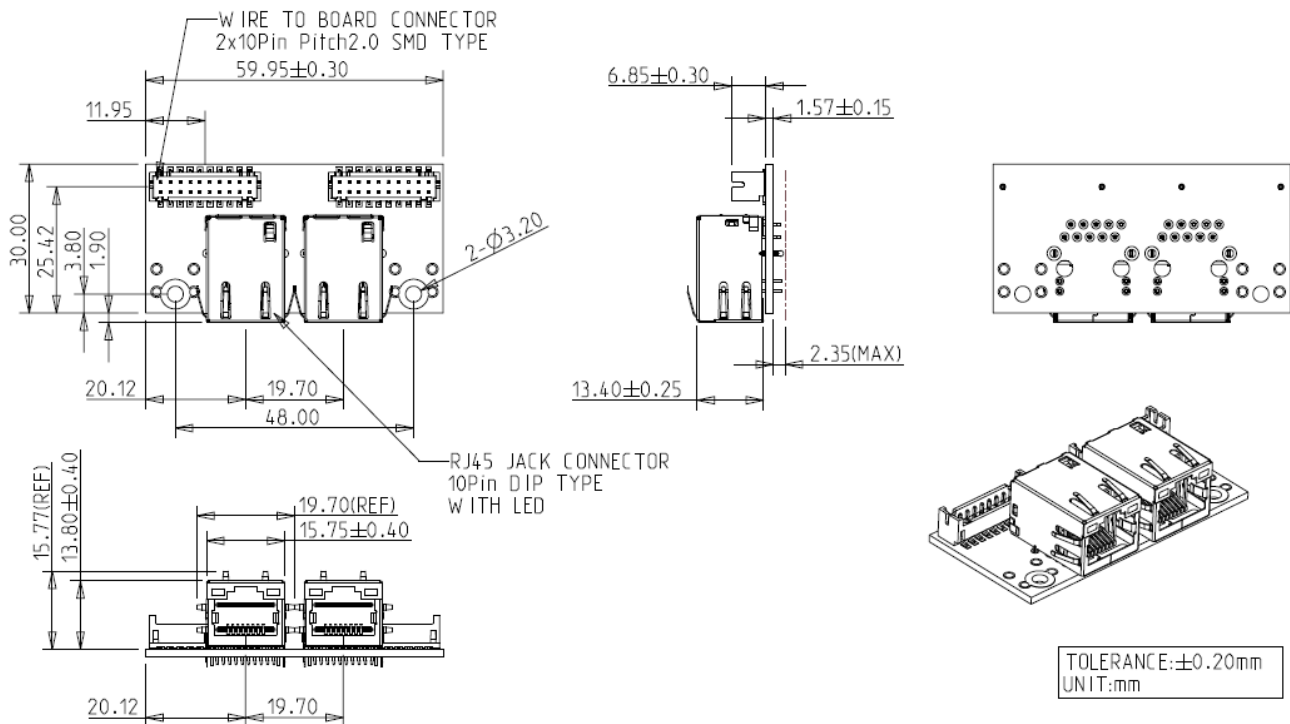


Figure 9: Bracket Daughter Board Drawing (EMPL-G2S1-C2/V2/W2)

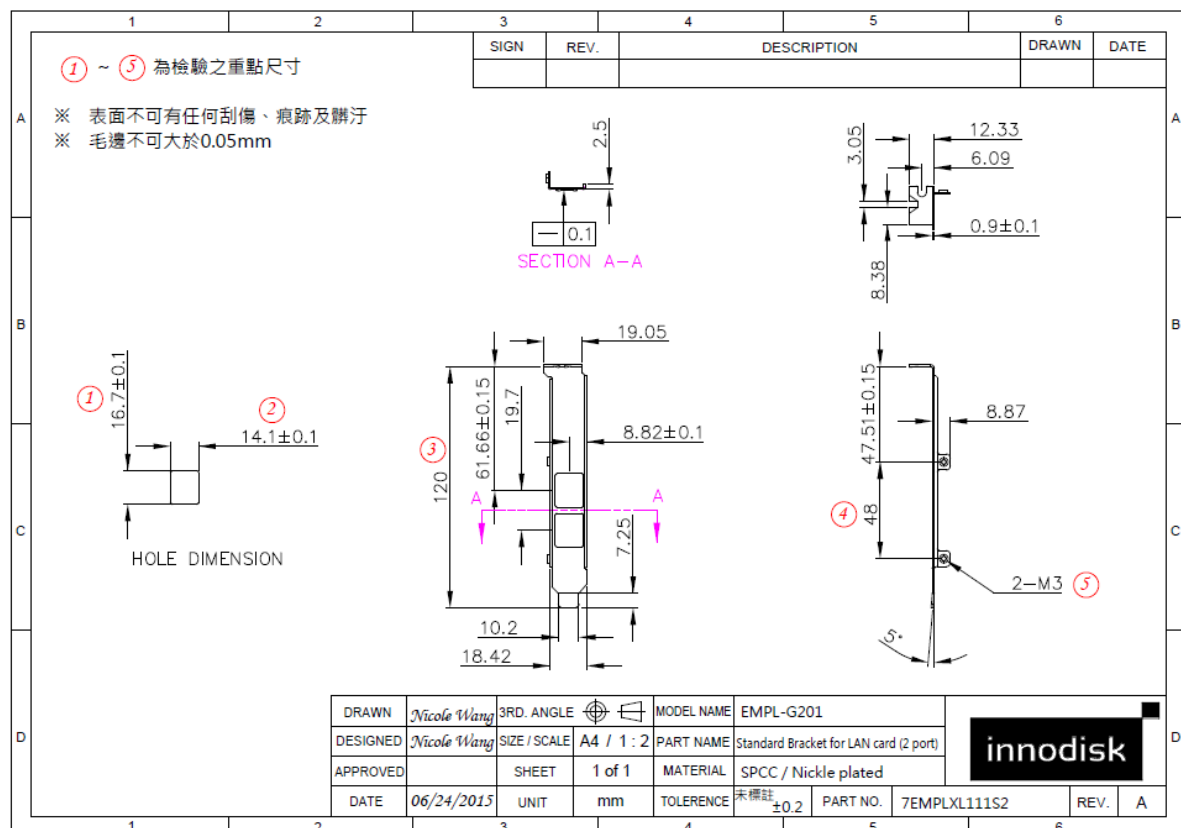


Figure 10: Bracket Drawing

### 2.6.5. Cable Mechanical Drawing

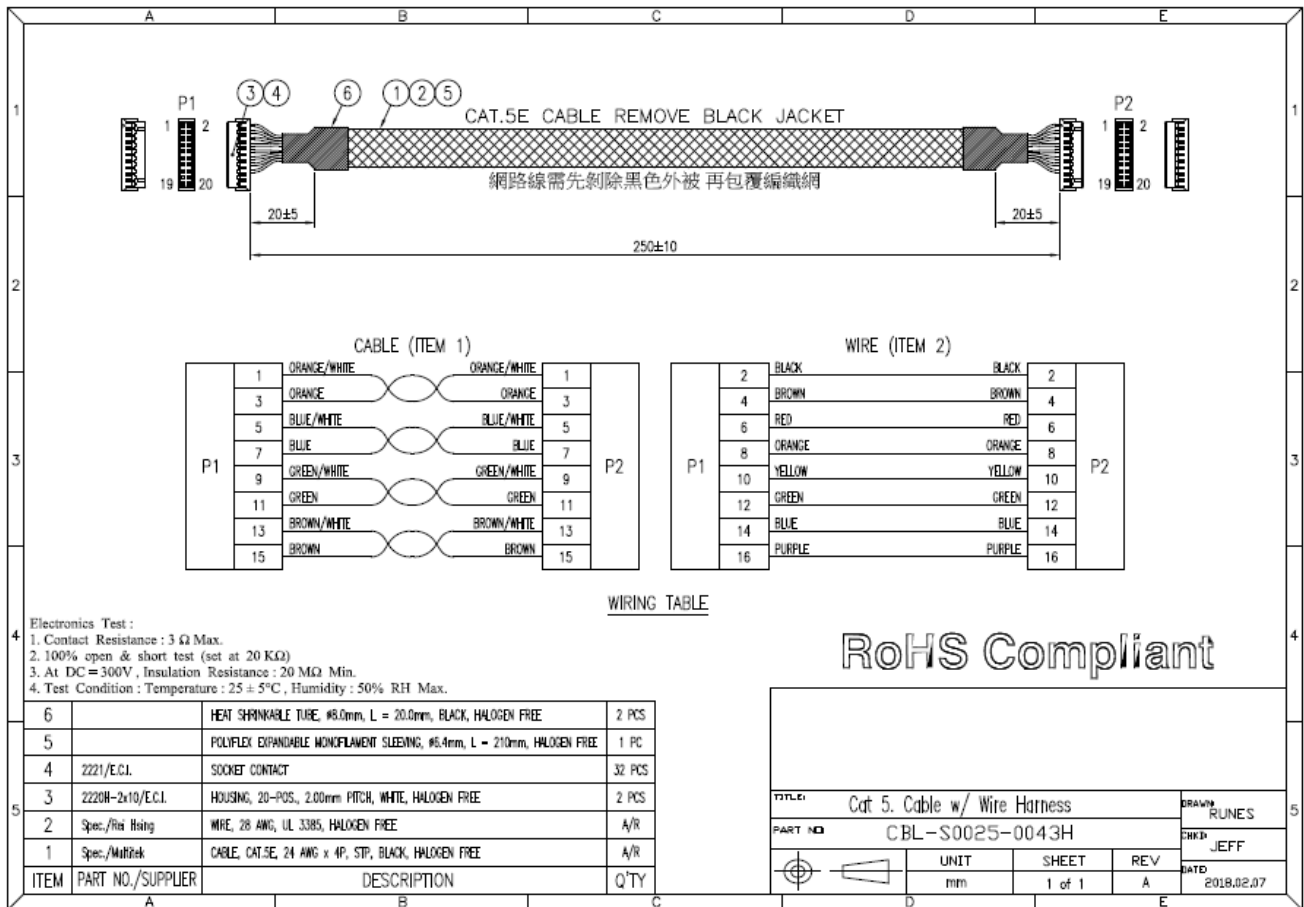


Figure 11: Board to Board LAN Cable Drawing

### 2.6.6. Packing List

- EMPL-G2S1 mPCIe Board x 1
- EMPL-G2S1 Daughter Board x 1
- Board to Board LAN Cable x 2
- Bracket x 1 (EMPL-G2S1-C2/V2/W2 only)
- Screw M3\*5 Silver x 2 (EMPL-G2S1 C2/V2/W2 only)

### 2.7. Software Support

- Windows: 10(64bit)
- Linux (igc): kernel 5.x version

## 3. Installation Guide

Please download driver from Myinnodisk web site.

<https://myinnodisk.innodisk.com/myinnodisk/Login.aspx>

Or you can download intel i225 chip driver from intel official web site directly.

<https://www.intel.com/content/www/us/en/products/details/ethernet/gigabit-controllers/i225-controllers/downloads.html>

## 4. Appedix

innodisk

### 宜鼎國際股份有限公司 Innodisk Corporation REACH Declaration

Tel: (02) 7703-3000 Fax: (02) 7703-3555 Internet: <https://www.innodisk.com/>

Innodisk Corporation pursues its social responsibility for global environmental preservation by committing to be compliant with REACH regulation (REGULATION (EC) No 1907/2006).

We hereby confirm that the product(s),

**Scope: Flash Memory, DRAM Module and Embedded Peripherals Products.**

- The standard products of **not listed** in the Appendix2 meet the requirements of REACH SVHC regulations (SVHCs < 0.1% in Article), as described in the candidate list table currently including 224 substances and shown on the ECHA website. (<http://echa.europa.eu/de/candidate-list-table>).
- The standard products listed in the Appendix2 contain(s) one or more hazardous substances or constituents exceeding 0.1 % by weight in article if not otherwise specified in candidate list table.  
Where the threshold value is exceeded, the substances in question are to be declared in accompanying. (SVHCs > 0.1% in Article).
- Comply with REACH Annex XVII.

#### 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:  陳怡全

Company Representative Title 公司代表人職稱: QA Manager 品保經理

Date 日期: 2022 / 06 / 14



## RoHS 自我宣告書 (RoHS Declaration of Conformity)

### Manufacturer Products: All Innodisk EM FLASH, DRAM and EP 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 及 (EU) 2015/863 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) and (EU) 2015/863 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.
- 三、 本公司聲明我們的產品符合 RoHS 指令的附件中 7(a)、7(c)-I、6(c) 允許豁免。  
We declare, our products permitted by the following exemptions specified in the Annex of the RoHS directive.
- ※ 7(a) Lead in high melting temperature type solders (i.e. lead-based alloys containing 85% by weight or more lead).
  - ※ 7(c)-I Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezoelectric devices, or in a glass or ceramic matrix compound.
  - ※ 6(c) Copper alloy containing up to 4% lead by weight.  
(This exemption applies to products that use antennas)

| Name of hazardous substance | Limited of RoHS ppm (mg/kg) |
|-----------------------------|-----------------------------|
| 鉛 (Pb)                      | < 1000 ppm                  |
| 汞 (Hg)                      | < 1000 ppm                  |
| 鎘 (Cd)                      | < 100 ppm                   |
| 六價鉻 (Cr 6+)                 | < 1000 ppm                  |
| 多溴聯苯 (PBBs)                 | < 1000 ppm                  |
| 多溴二苯醚 (PBDEs)               | < 1000 ppm                  |
| 鄰苯二甲酸二(2-乙基己基)酯 (DEHP)      | < 1000 ppm                  |
| 鄰苯二甲酸丁酯苯甲酯 (BBP)            | < 1000 ppm                  |
| 鄰苯二甲酸二丁酯 (DBP)              | < 1000 ppm                  |

宜鼎國際股份有限公司  
Innodisk Corporation

鄰苯二甲酸二異丁酯 (DIBP)

&lt; 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: Randy Chien 簡川勝

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

Date 日期: 2021 / 06 / 09



# CERTIFICATE OF CONFORMITY



**Product** : mPCIe to Dual GbE LAN Module  
**Brand** : Innodisk  
**Model No.** : EMPL-G#S1  
#: Output items: ( 1:1Port,2:2Ports)  
**Applicant** : Innodisk Corporation  
**Report No.** : CEBDBO-WTW-P22070393

We, **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, declare that the equipment above has been tested in our facility and found compliance with the requirement limits of applicable standards, in accordance with the Directive 2014/30/EU. The test record, data evaluation and Equipment Under Test (EUT) configurations represented herein are true and accurate under the standards herein specified.

**EN 55032:2015 +A11:2020, Class B**

**EN 61000-3-2:2014 (Not Applicable)**

**EN IEC 61000-3-2:2019 +A1:2021 (Not Applicable)**

**EN 61000-3-3:2013 +A2:2021 (Not Applicable)**

**EN 55035:2017 +A11:2020**

EN 61000-4-2:2009 / IEC 61000-4-2:2008 ED. 2.0

EN 61000-4-3:2006 +A1:2008 +A2:2010 / IEC 61000-4-3:2010 ED. 3.2

EN IEC 61000-4-3:2020 / IEC 61000-4-3:2020 ED. 4.0

EN 61000-4-4:2012 / IEC 61000-4-4:2012 ED. 3.0

EN 61000-4-5:2014 +A1:2017 / IEC 61000-4-5:2017 ED. 3.1 (Not Applicable)

EN 61000-4-6:2014+AC:2015 / IEC 61000-4-6:2013 ED. 4.0

EN 61000-4-8:2010 / IEC 61000-4-8:2009 ED. 2.0

EN 61000-4-11:2004 +A1: 2017 / IEC 61000-4-11:2017 ED. 2.1 (Not Applicable)

EN IEC 61000-4-11:2020 / IEC 61000-4-11:2020 ED. 3.0 (Not Applicable)

**NOTE:** The above EN/IEC basic standards are applied with latest version if customer has no special requirement.

*Jim Hsiang*

Jim Hsiang / Associate Technical Manager

2022/8/18



No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Tel: 886-2-26052180 Fax: 886-2-26051924

<http://www.bureauveritas-adt.com> E-Mail: [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

# CERTIFICATE OF CONFORMITY



**Product** : mPCIe to Dual GbE LAN Module  
**Brand** : Innodisk  
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**Applicant** : Innodisk Corporation  
**Report No.** : CEBDBO-WTW-P22070393

We, **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, declare that the equipment above has been tested in our facility and found compliance with the requirement limits of applicable standards, in accordance with the Electromagnetic Compatibility Regulations 2016 (S.I. 2016/1091). The test record, data evaluation and Equipment Under Test (EUT) configurations represented herein are true and accurate under the standards herein specified.

**BS EN 55032:2015 +A11:2020, Class B**

**BS EN 61000-3-2:2014 (Not Applicable)**

**BS EN IEC 61000-3-2:2019+A1:2021 (Not Applicable)**

**BS EN 61000-3-3:2013+A2:2021 (Not Applicable)**

**BS EN 55035:2017 +A11:2020**

BS EN 61000-4-2:2009 / IEC 61000-4-2:2008 ED. 2.0

BS EN 61000-4-3:2006 +A1:2008 +A2:2010 / IEC 61000-4-3:2010 ED. 3.2

BS EN IEC 61000-4-3:2020 / IEC 61000-4-3:2020 ED. 4.0

BS EN 61000-4-4:2012 / IEC 61000-4-4:2012 ED. 3.0

BS EN 61000-4-5:2014 +A1:2017 / IEC 61000-4-5:2017 ED. 3.1 (Not Applicable)

BS EN 61000-4-6:2014 +AC:2015 / IEC 61000-4-6:2013 ED. 4.0

BS EN 61000-4-8:2010 / IEC 61000-4-8:2009 ED. 2.0

BS EN 61000-4-11:2004 +A1: 2017 / IEC 61000-4-11:2017 ED. 2.1 (Not Applicable)

BS EN IEC 61000-4-11:2020 / IEC 61000-4-11:2020 ED. 3.0 (Not Applicable)

**NOTE:** The above BS EN/IEC basic standards are applied with latest version if customer has no special requirement.

*Jim Hsiang*

Jim Hsiang / Associate Technical Manager

2022/8/18



No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Tel: 886-2-26052180 Fax: 886-2-26051924

<http://www.bureauveritas-adt.com> E-Mail: [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)



## CERTIFICATE OF CONFORMITY

**Standard:** ICES-003:2020 Issue 7, Class B  
ICES-Gen:2018 Issue 1 +A1:2021  
ANSI C63.4-2014 amended as per ANSI C63.4a-2017

**Report No.:** CIBDBO-WTW-P22070393

**Model No.:** EMPL-G#S1  
#: Output items: ( 1:1Port,2:2Ports)

**Received Date:** 2022/7/13

**Test Date:** 2022/7/18 ~ 2022/7/24

**Issued Date:** 2022/8/18

**Applicant:** Innodisk Corporation

**Address:** 5F., No. 237, Sec. 1, Datong Rd., Xizhi Dist., New Taipei City 221005, Taiwan (R.O.C.)

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Lin Kou Laboratories

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

**Test Location:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

**Approved by:**

*Jim Hsiang*  
Jim Hsiang / Associate Technical Manager

, **Date:**

2022/8/18

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Prepared by : Albee Chu / Senior Specialist

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## CERTIFICATE OF CONFORMITY

**Standard:** 47 CFR FCC Part 15, Subpart B, Class B  
ANSI C63.4:2014

**Report No.:** FDBDBO-WTW-P22070393

**Model No.:** EMPL-G#S1  
#: Output items: ( 1:1Port,2:2Ports)

**Received Date:** 2022/7/13

**Test Date:** 2022/7/18 ~ 2022/7/24

**Issued Date:** 2022/8/18

**Applicant:** Innodisk Corporation

**Address:** 5F., No. 237, Sec. 1, Datong Rd., Xizhi Dist., New Taipei City 221005, Taiwan (R.O.C.)

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Lin Kou Laboratories

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

**Test Location:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

**FCC Registration /**

**Designation Number:** 418586 / TW1078

**Approved by:**

*Jim Hsiang*  
Jim Hsiang / Associate Technical Manager

**Date:**

2022/8/18

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Prepared by : Albee Chu / Senior Specialist

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# Contact us

## Headquarters (Taiwan)

5F., No. 237, Sec. 1, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

Tel: +886-2-77033000

Email: sales@innodisk.com

## Branch Offices:

### USA

usasales@innodisk.com

+1-510-770-9421

### Europe

eusales@innodisk.com

+31-40-3045-400

### Japan

jpsales@innodisk.com

+81-3-6667-0161

### China

sales\_cn@innodisk.com

+86-755-2167-3689

**www.innodisk.com**

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October 17, 2022