innodisk

Total Solution For
Embedded Peripherals

EMPU-3401

mPCIe to four USB 3.0 Module

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 Released	Aug, 2019
1.1	mPCIe Pin Define 3.3V => 3.3V AUX	Mar, 2020
1.2	Update RoHS & REACH	Sep, 2020
1.3	Add the method of unplug USB 3.0 connector from mainboard	Feb, 2021

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1. Product Introduction

1.1. Overview

Innodisk EMPU-3401 is designed with standard Mini PCI Express form factor, EMPU-3401 supports PCIe Gen 2.0 with a single lane to four independent USB 3.0 ports. EMPU-3401 supports USB battery charging specification rev. 1.2 and compliant with xHCI 1.0, USB 3.0 rev 1.0 which brings you a flexible design for small form factor or embedded systems.

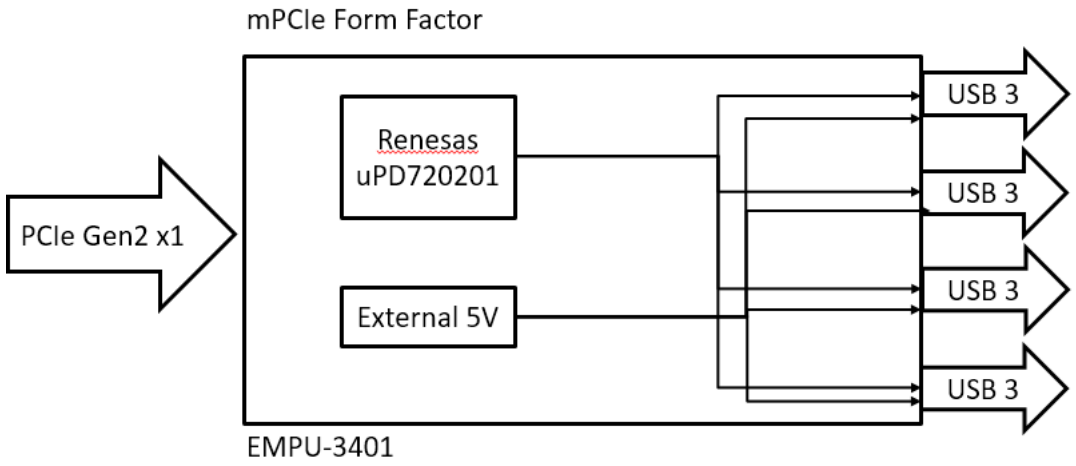

Figure 1: Block Diagram

1.2. Features

- Supports 4 USB 3.0 ports (share PCIe Gen2 x1 bandwidth).
- Independent 1.5A overcurrent protection (OCP) for each port.
- Compliant with xHCI 1.0, USB 3.0 Rev 1.0.
- Two USB ports from CN1 provides limited power natively.
- Two USB ports from CN2 needs external power.
- Supports USB Battery Charging Specification Revision 1.2.
- Optional Industrial Temperature (-40°C to +85°C) support.

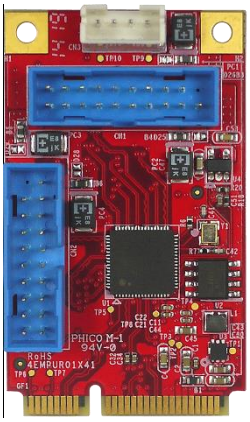

Figure 2: mPCIe Board Picture

Figure 3: 19pin Pitch 2.0 Connector to 2 USB 3.0 Cable

Figure 4: 4pin Power Cable

2. Product Specifications

2.1. Device Parameters

Table 1: Device Parameters

Form Factor	mPCIe
Input I/F	PCI Express 2.0 x 1
Output I/F	USB 3.0 x 4
Output Connector	19 Pin Pitch 2.0 Connector
Dimension (WxLxH)	mPCIe Board: 30.0 x 50.9 x 8.45 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

Full Load (mA)	Voltage (V)
340	3.3

2.3. Environmental Specifications

2.3.1. Temperature Ranges

Table 4: Temperature Ranges

Temperature	Range
Operating	Standard Grade: 0°C to +70°C 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)
EMPU-3401-C1	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	12,212,836
EMPU-3401-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	14,636,576

2.4. CE and FCC Compatibility

EMPU-3401 conforms to CE and FCC requirements.

2.5. RoHS Compliance

EMPU-3401 is fully compliant with RoHS directive.

2.6. Hardware

2.6.1. Layout

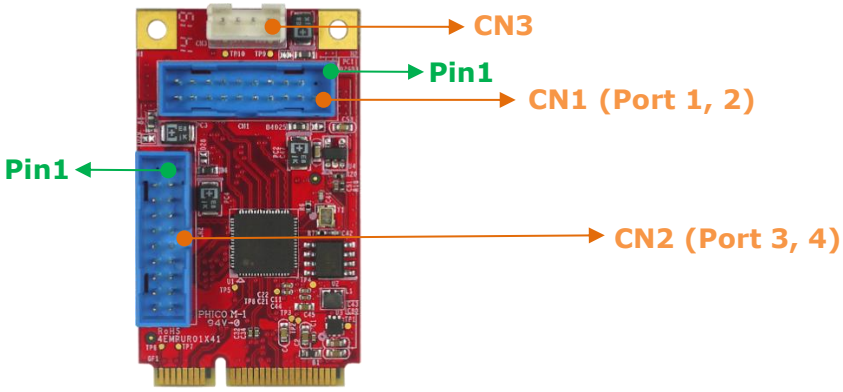

Table 7: mPCIe PCB Layout Legend

Label	Connector Type	Function
CN1	Wire to board SMD 2*10P (cut 1pin) 180° P:2.0mm	USB 3.0 Signal
CN2	Wire to board SMD 2*10P (cut 1pin) 180° P:2.0mm	USB 3.0 Signal
CN3	4 Pin Header P:2.0mm	External 5V Power *Please note that only port 1, 2 can be detected with 200mA each port if 4pin power cable is not connected.

2.6.2. How to Unplug USB 3.0 19pin Connectors from Mainboard

The USB 3.0 19pin connector is a standard connector that is not designed for multi-times plug/unplug usage. The purpose of the USB 3.0 19pin connector is to securely connect when the cable is plugged in, not to allow users to unplug easily. Therefore, there are small tabs located on the cable connector that clips into the pin header connector from the inside.

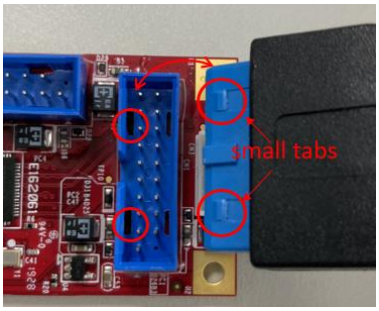

Figure 5. Small tabs on the USB 3.0 19pin connector

To pull off the USB 3.0 cable, DO NOT unplug the USB cable from the module directly, Wiggle Left-Right to release the small tabs from sockets then unplug the cable, refer to the below pictures for example:

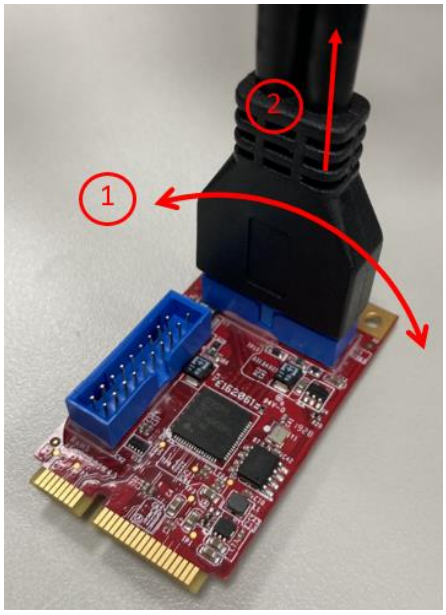

Figure 6. Wiggle Left- Right then unplug the cable

2.6.3. Pin Define

Table 8: mPCIe Pin Define

Signal Name	Pin #	Pin #	Signal Name
NC	**51**	**52**	3.3V AUX
NC	**49**	**50**	GND
NC	**47**	**48**	NC
NC	**45**	**46**	NC
GND	**43**	**44**	NC
3.3V AUX	**41**	**42**	NC
3.3V AUX	**39**	**40**	GND
GND	**37**	**38**	NC
GND	**35**	**36**	NC
RX+	**33**	**34**	GND
RX-	**31**	**32**	NC
GND	**29**	**30**	NC
GND	**27**	**28**	NC
TX+	**25**	**26**	GND

TX-	**23**	**24**	3.3V AUX
GND	**21**	**22**	PERST#
NC	**19**	**20**	NC
NC	**17**	**18**	GND
GND	**15**	**16**	NC
CLK+	**13**	**14**	NC
CLK-	**11**	**12**	NC
GND	**9**	**10**	NC
CLK	**7**	**8**	NC
NC	**5**	**6**	NC
NC	**3**	**4**	GND
PE_WAKE_N	**1**	**2**	3.3V AUX

2.6.4. I/O Connector Mechanical Drawing & Pin Defines

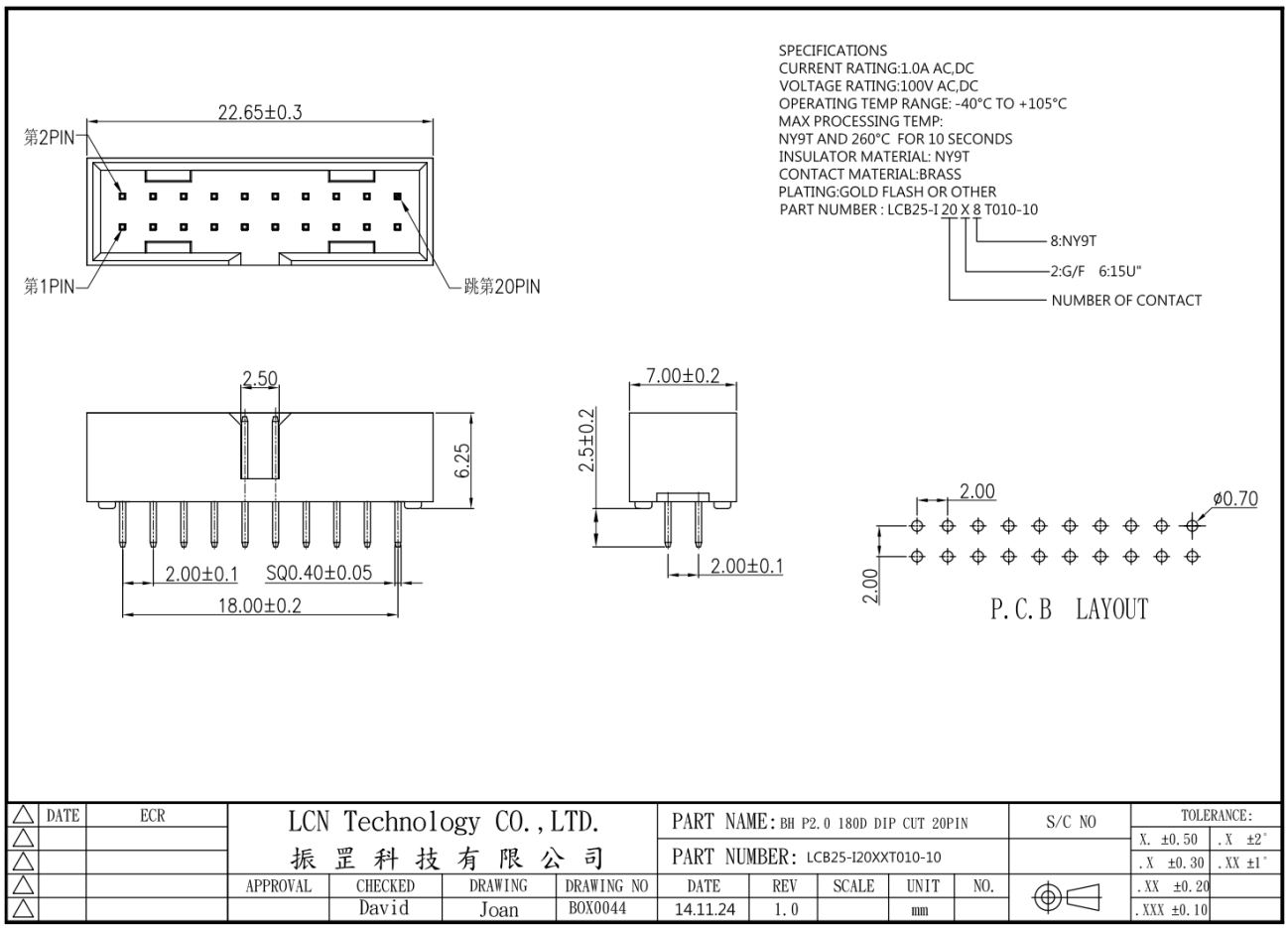

Figure 7: Wire to Board SMD 2*10P (cut 1pin) Connector Drawing

Table 9: Wire to Board SMD 2*10P (cut 1pin) Connector (CN1) Pin Define

Signal Name	Pin #	Pin #	Signal Name
NC	**10**	**11**	U2P2_D+
U2P1_D+	**9**	**12**	U2P2_D-
U2P1_D-	**8**	**13**	GND
GND	**7**	**14**	U3P2_TXDP
U3P1_TXDP	**6**	**15**	U3P2_TXDN
U3P1_TXDN	**5**	**16**	GND
GND	**4**	**17**	U3P2_RXDP
U3P1_RXDP	**3**	**18**	U3P2_RXDN
U3P1_RXDN	**2**	**19**	5V_P2
5V_P1	**1**		

Table 10: Wire to Board SMD 2*10P (cut 1pin) Connector (CN2) Pin Define

Signal Name	Pin #	Pin #	Signal Name
NC	**10**	**11**	U2P4_D+
U2P3_D+	**9**	**12**	U2P4_D-
U2P3_D-	**8**	**13**	GND
GND	**7**	**14**	U3P4_TXDP
U3P3_TXDP	**6**	**15**	U3P4_TXDN
U3P3_TXDN	**5**	**16**	GND
GND	**4**	**17**	U3P4_RXDP
U3P3_RXDP	**3**	**18**	U3P4_RXDN
U3P3_RXDN	**2**	**19**	5V_P4
5V_P3	**1**		

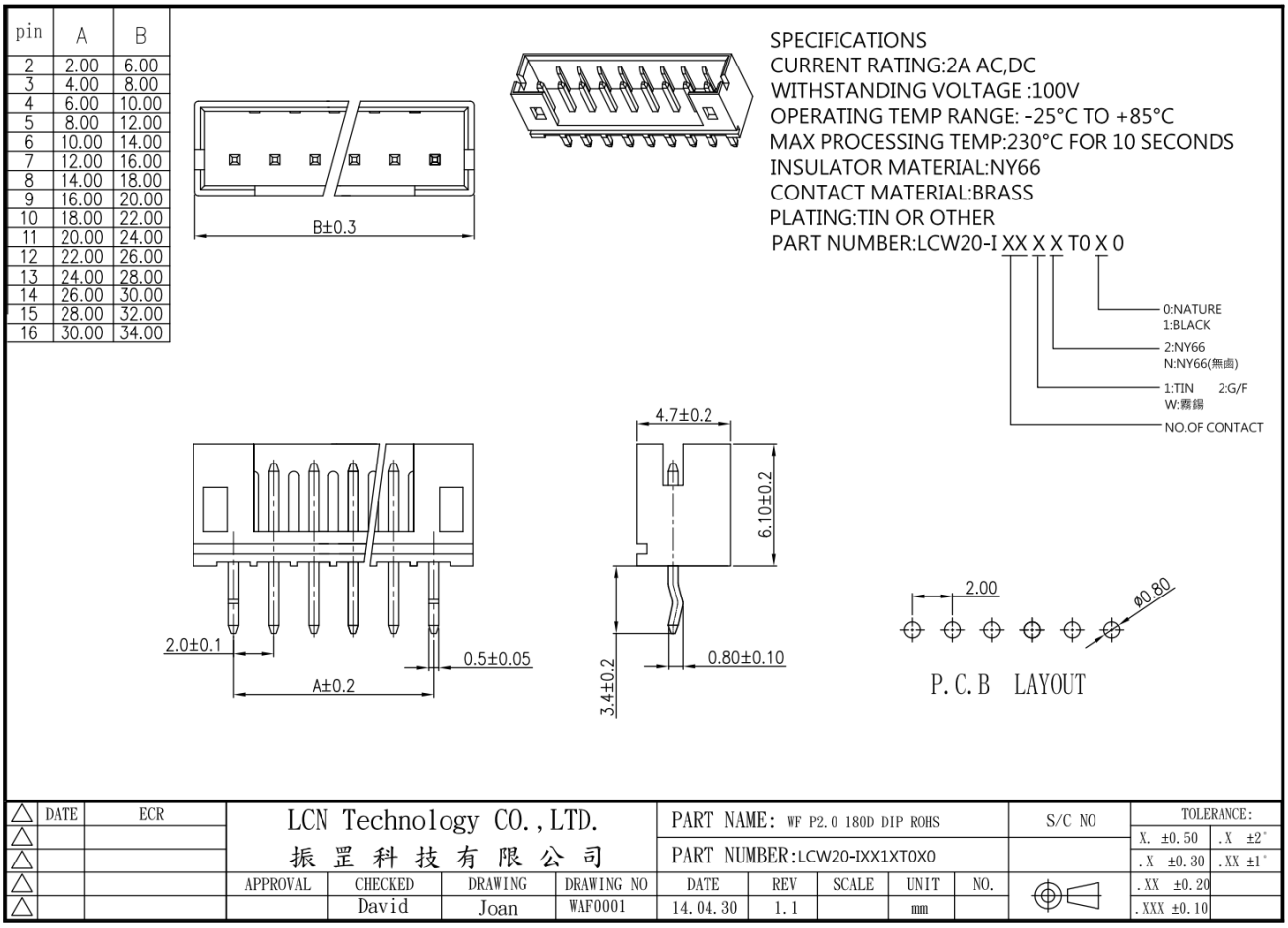

Figure 8: 4 Pin Header P:2.0mm Drawing

Table 11: 4 Pin Header (CN3) Pin Define

Signal Name	Pin #
5V	**1**
GND	**2**
GND	**3**
5V	**4**

2.6.5. EMPU-3401 Mechanical Drawing

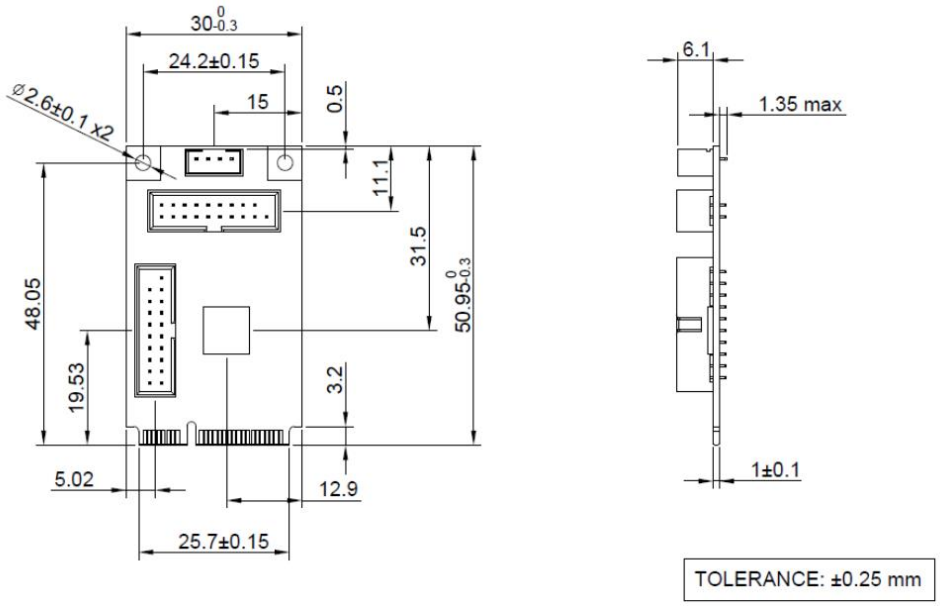

Figure 9: EMPU-3401 mPCIe Board Drawing

2.6.6. Cable Mechanical Drawing

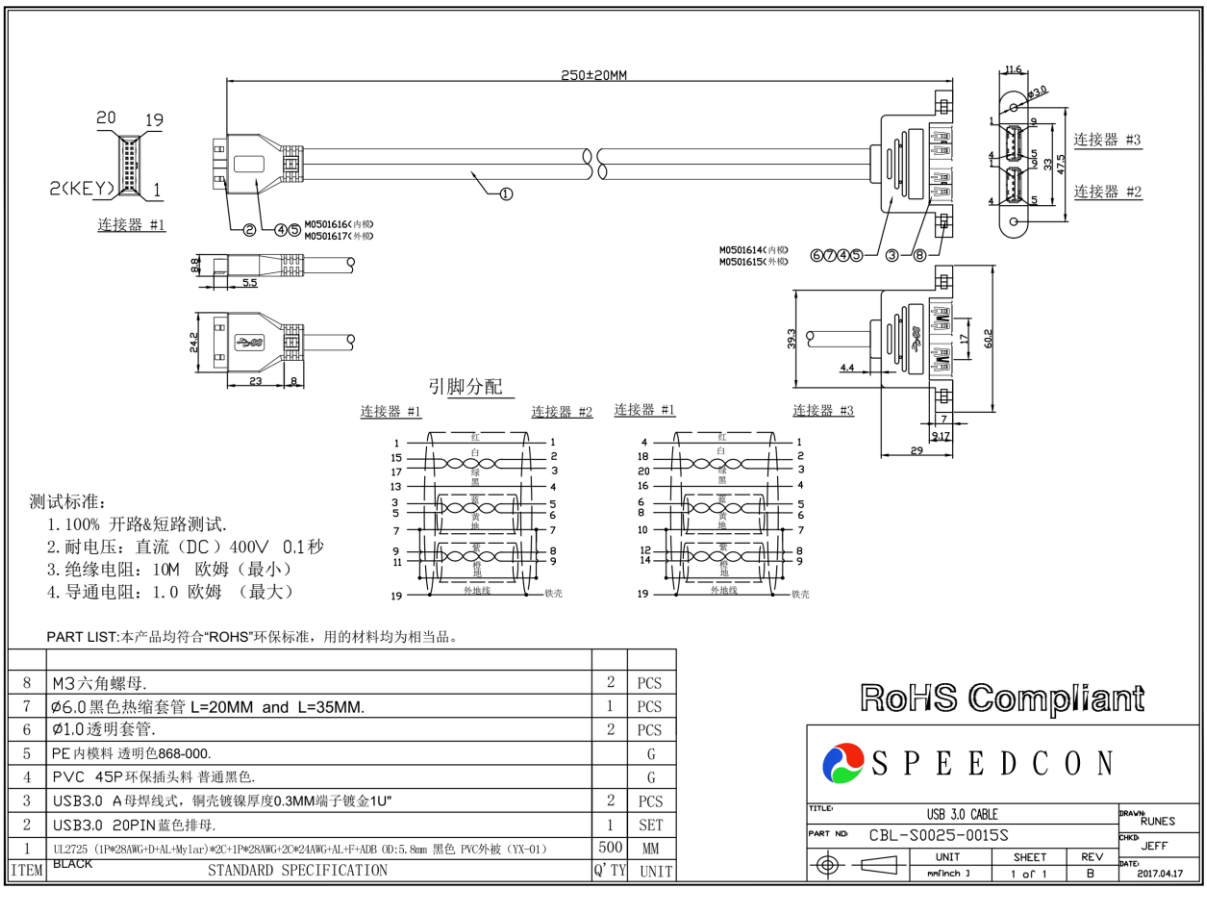

Figure 10: 19pin Pitch 2.0 Connector to 2 USB Cable Drawing

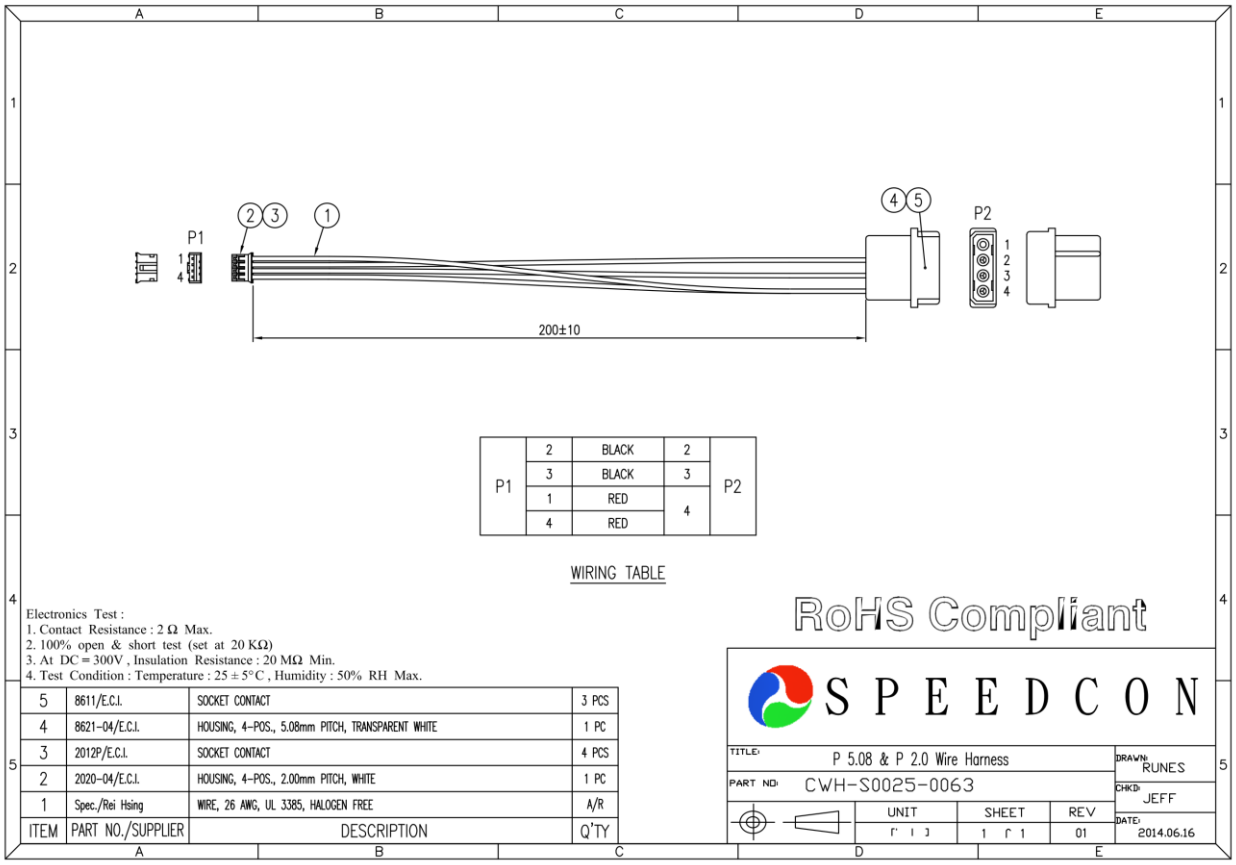

Figure 11: 4 Pin Header Pitch 2.0 Power Cable Drawing

2.6.7. Packing List

- EMPU-3401 mPCIe Board x 1
- 19pin Pitch 2.0 Connector to 2 USB Cable x 2
- 4pin Pitch 2.0 Power Cable x 1

2.7. Software Support

- Windows: XP(32bit), 7(32/64bit), 8/8.1(32/64 bit), 10(32/64bit)
- Linux: Kernel 2.6 above.

➢ After Win8 and Linux Kernel v2.6.31 supports built-in xHCI 1.0 driver.

2.8. Application Note

EMPU-3401 module doesn’t support OC(Over Current) warning.

3. Appedix

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

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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) delivered to

Innodisk P/N	Description
All Innodisk EP Products	

☐ contain(s) **no** hazardous substances or constituents exceeding the defined threshold 0.1 % by weight in homogenous material if not otherwise specified, as described in the candidate list table currently including 209 substances and shown on the ECHA website (http://echa.europa.eu/de/candidate-list-table).

☑ contain(s) one or more hazardous substances or constituents exceeding 0.1 % by weight in homogenous material if not otherwise specified in candidate list table. Where the threshold value is exceeded, the substances in question are to be declared in accompanying Appendix A.

☑ 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： Randy Chien 簡川勝

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

Date 日期： 2020 / 07 / 01

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宜鼎國際股份有限公司
Innodisk Corporation

Tel:(02)7703-3000 Internet: https://www.innodisk.com/

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(7a)、(7c-I)允許豁免。
We declare, our products permitted by the following exemptions specified in the Annex of the RoHS directive.

※ (7a) Lead in high melting temperature type solders(i.e. lead-based alloys containing 85% by weight or more lead).

※ (7C-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.

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
鄰苯二甲酸二異丁酯 (DIBP)	< 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： 2020 / 03 / 03

Certificate

Issue Date: March 10, 2016
Ref. Report No. ISL-16LE101CE

Product Name	:	Mini PCIe to four USB 3.0 Module
Model	:	E%PU-3401 (%: Form factor: (2:2.5"SSD, 3:DDR3 DIMM, D:Dongle, G:NGFF_M.2, H:mPCIe Half, L:PCIe Low profile, M:mPCIe, S:SATA, X:Multi, Z:Others))
Responsible Party	:	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 in European Council Directive- EMC Directive 2004/108/EC (marketed before 2016/04/19) 2014/30/EU (marketed after 2016/04/20). The device was passed the test performed according to :

CE

Standards:

EN 55022: 2010+AC2011 and CISPR 22: 2008 (modified)
EN 61000-3-2:2014 and IEC 61000-3-2:2014
EN 61000-3-3: 2013 and IEC 61000-3-3: 2013
EN 55024: 2010 and CISPR 24: 2010
EN 61000-4-2: 2009 and IEC 61000-4-2: 2008
EN 61000-4-3: 2006+A1: 2008 +A2: 2010 and
IEC 61000-4-3:2006+A1: 2007+A2: 2010
EN 61000-4-4:2012 and IEC 61000-4-4:2012

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

W.H. Chang / Director

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Nemko ELA113A

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ilac-MRA TAF Nemko ELA113B

Certificate

Issue Date: March 10, 2016
Ref. Report No. ISL-16LE101FB

Product Name	:	Mini PCIe to four USB 3.0 Module
Model	:	E%PU-3401 (%: Form factor: (2:2.5"SSD, 3:DDR3 DIMM, D:Dongle, G:NGFF_M.2, H:mPCIe Half, L:PCIe Low profile, M:mPCIe, S:SATA, X:Multi, Z:Others))
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).

Standards:

FCC CFR Title 47 Part 15 Subpart B: 2014- Section 15.107 and 15.109
ANSI C63.4-2014
Industry Canada Interference-Causing Equipment Standard ICES-003 Issue 6: 2016

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

W.H. Chang / Director

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