innodisk

Total Solution For
Embedded Peripherals

EMP2-X404

mPCIe to four
RS232/422/485

Customer:

Customer Part Number:

Innodisk Part Number:

Innodisk Model Name:

Date:

Innodisk Approver	Customer Approver

Table of Contents

REVISION HISTORY

Revision	Description	Date
1.0	First Released	Sep, 2018
1.1	Update MTBF value	Jul, 2019
1.2	mPCIe Pin Define 3.3V => 3.3V AUX	Mar, 2020
1.3	Modify CLKREQ pin to GND	Dec, 2021

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1. Product Introduction

1.1. Overview

Innodisk EMP2-X404 is designed with standard Mini PCI Express form factor, EMP2-X404 supports PCIe Gen 2.0 with a single lane to four independent UARTs RS232/422/485, optimized for higher performance and lower power, which brings you a flexible expansion solution for embedded systems.

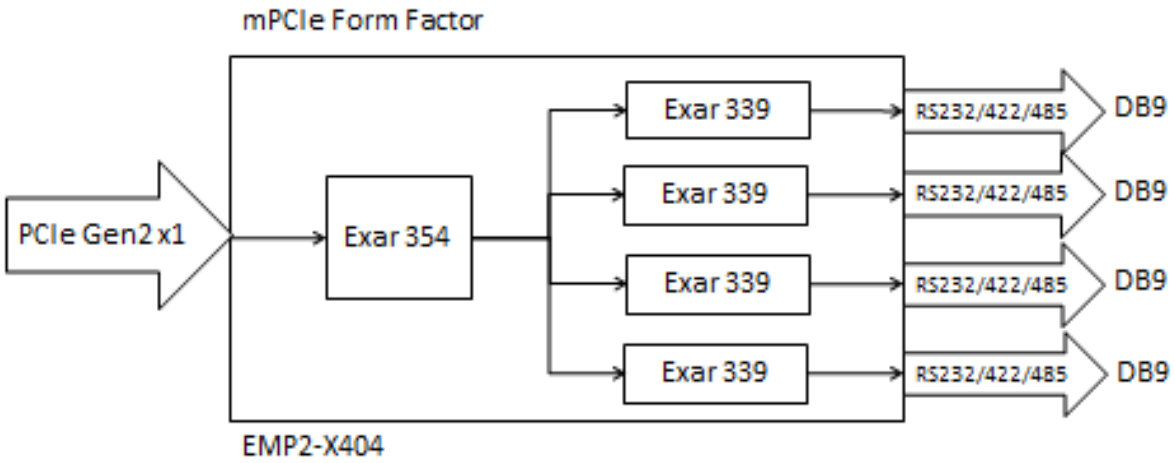


Figure 1: Block Diagram

1.2. Features

- PCIe 2.0 compliant. RS-232/422/485 mode configurable by software
- Up to 1 Mbps RS232 and 15Mbps RS422/485 serial data rate. 16C550 compatible. 256-byte FIFOs
- Industrial temperature (-40 ºC to 85 ºC) operation
- Full RS-232 functions with DB9 connector
- Minimize possible mechanical intervention without daughterboard
- Termination resistor enabled/disabled by DIP switch
- RI/5V/12V output switched by Jumper
- ESD up to 15KV(Electrostatic Discharge) protection circuit to prevent system damage

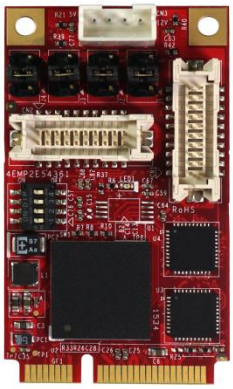


Figure 2: Picture

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	RS-232/422/485
Output Connector	DB-9 x 4
Dimension (WxLxH)	30 x 50.9 x 8 mm

2.2. Performance

Table 2: RS232/422/485 Performance (unit: second)

Baud Rate	Transmission Data Size	RS232	RS485 Half Duplex		RS485 Full Duplex (RS422)	
		10m	100m	200m	100m	200m
9600	5Kbyte	5	5	5	5	5
	1Mbyte	1,266	1,267	1,267	1,267	1,267
115200	1Mbyte	105	106	106	106	106
460800	1Mbyte	26	26	26	28	27
921600	1Mbyte	13	13	13	13	14

2.3. Electrical Specifications

2.3.1. Power Requirement

Table 3: Power Requirement

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

2.3.2. Power Consumption

Table 4: Power Consumption

Full Load (mA)	Voltage (V)
150	3.3

2.4. Environmental Specifications

2.4.1. Temperature Ranges

Table 5: Temperature Ranges

Temperature	Range
Operating	Industrial Grade: -40°C to +85°
Storage	-55°C to +95°

2.4.2. Humidity

Relative Humidity: 10-95%, non-condensing

2.4.3. Shock and Vibration

Table 6: 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

2.4.4. 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 7: Mean Time between Failure (MTBF)

Product	Condition	MTBF (Hours)
EMP2-X404	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	19,167,421

2.5. CE and FCC Compatibility

EMP2-X404 conforms to CE and FCC requirements.

2.6. RoHS Compliance

EMP2-X404 is fully compliant with RoHS directive.

2.7. Hardware

2.7.1. Layout

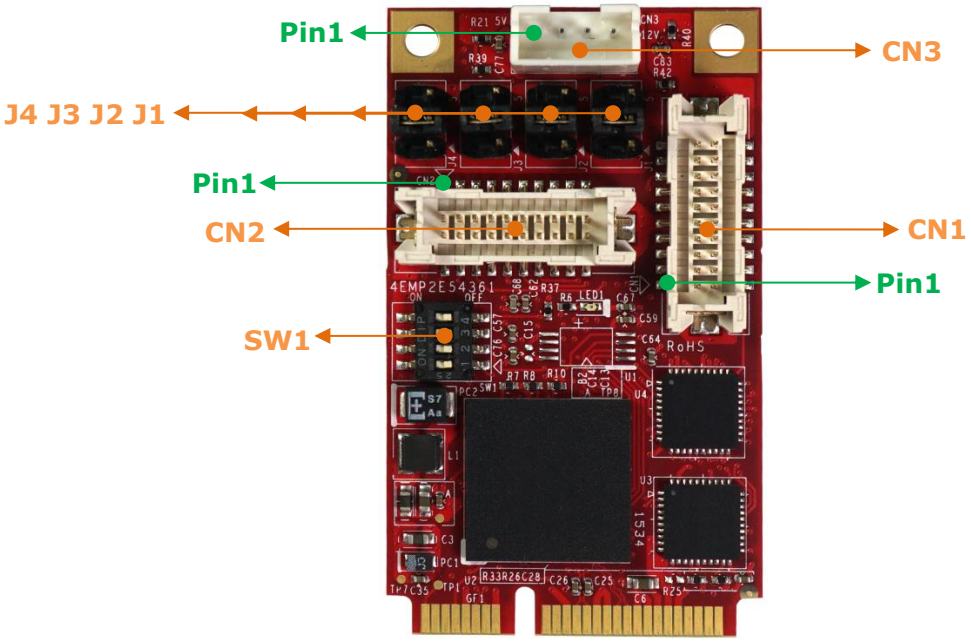


Table 8: PCB Layout Legend

Label	Connector Type	Function
CN1	Wire to board SMD 2*10P 180° P:1.25mm H:4.8mm	Port 1(red edge cable), 2
CN2	Wire to board SMD 2*10P 180° P:1.25mm H:4.8mm	Port 3(red edge cable), 4
CN3	Wafer DIP 1*4P 180° P:2.0mm	Power input for DB9 pin9 (5V/12V)
J1	Pin Header DIP 2*3P(w/o pin2,6) 180° P:2.0mm	Port 1 DB9 pin9 mode setting (RI/5V/12V)
J2	Pin Header DIP 2*3P(w/o pin2,6) 180° P:2.0mm	Port 2 DB9 pin9 mode setting (RI/5V/12V)
J3	Pin Header DIP 2*3P(w/o pin2,6) 180° P:2.0mm	Port 3 DB9 pin9 mode setting (RI/5V/12V)
J4	Pin Header DIP 2*3P(w/o pin2,6) 180° P:2.0mm	Port 4 DB9 pin9 mode setting (RI/5V/12V)
SW1	DIP Switch, 8pin SMD 180°	RS422/485 Terminal resistor on/off

2.7.2. Pin Define

Table 9: 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
PERXP	**33**	**34**	GND
PERXN	**31**	**32**	NC
GND	**29**	**30**	NC
GND	**27**	**28**	NC
PETXP	**25**	**26**	GND
PETXN	**23**	**24**	3.3V AUX
GND	**21**	**22**	PERST#
NC	**19**	**20**	NC
NC	**17**	**18**	GND
GND	**15**	**16**	NC
REFCLK+	**13**	**14**	NC
REFCLK-	**11**	**12**	NC
GND	**9**	**10**	NC
GND	**7**	**8**	NC
NC	**5**	**6**	NC
NC	**3**	**4**	GND
WAKE #	**1**	**2**	3.3V AUX

2.7.3. I/O Connector Mechanical Drawing & Pin Defines

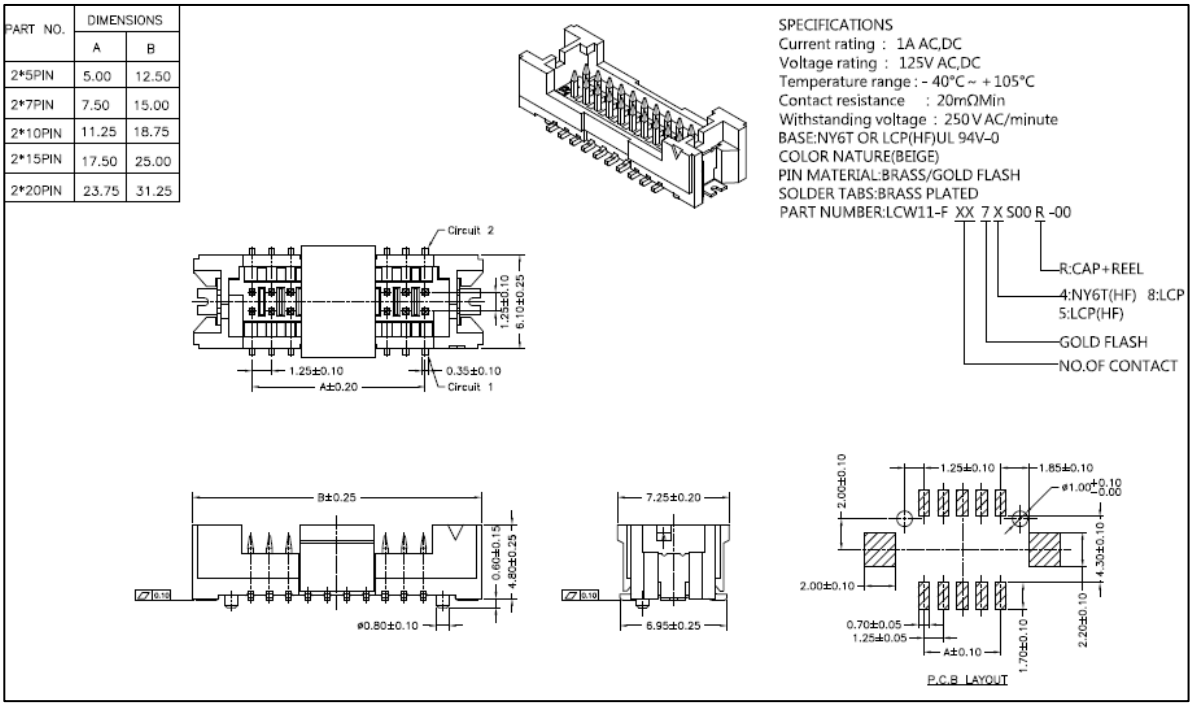


Figure 3: Wire to Board SMD 2*10P Connector Drawing (CN1/CN2)

Table 10: Wire to Board SMD 2*10P Connector Pin Define (CN1/CN2)

Signal Name	Pin #	Pin #	Signal Name
CD_P2	**2**	**1**	CD_P1
RX_P2	**4**	**3**	RX_P1
TX_P2	**6**	**5**	TX_P1
DTR_21	**8**	**7**	DTR_P1
GND	**10**	**9**	GND
DSR_P2	**12**	**11**	DSR_P1
RTS_P2	**14**	**13**	RTS_P1
CTS_P2	**16**	**15**	CTS_P1
RI_P2	**18**	**17**	RI_P1
NC	**20**	**19**	NC

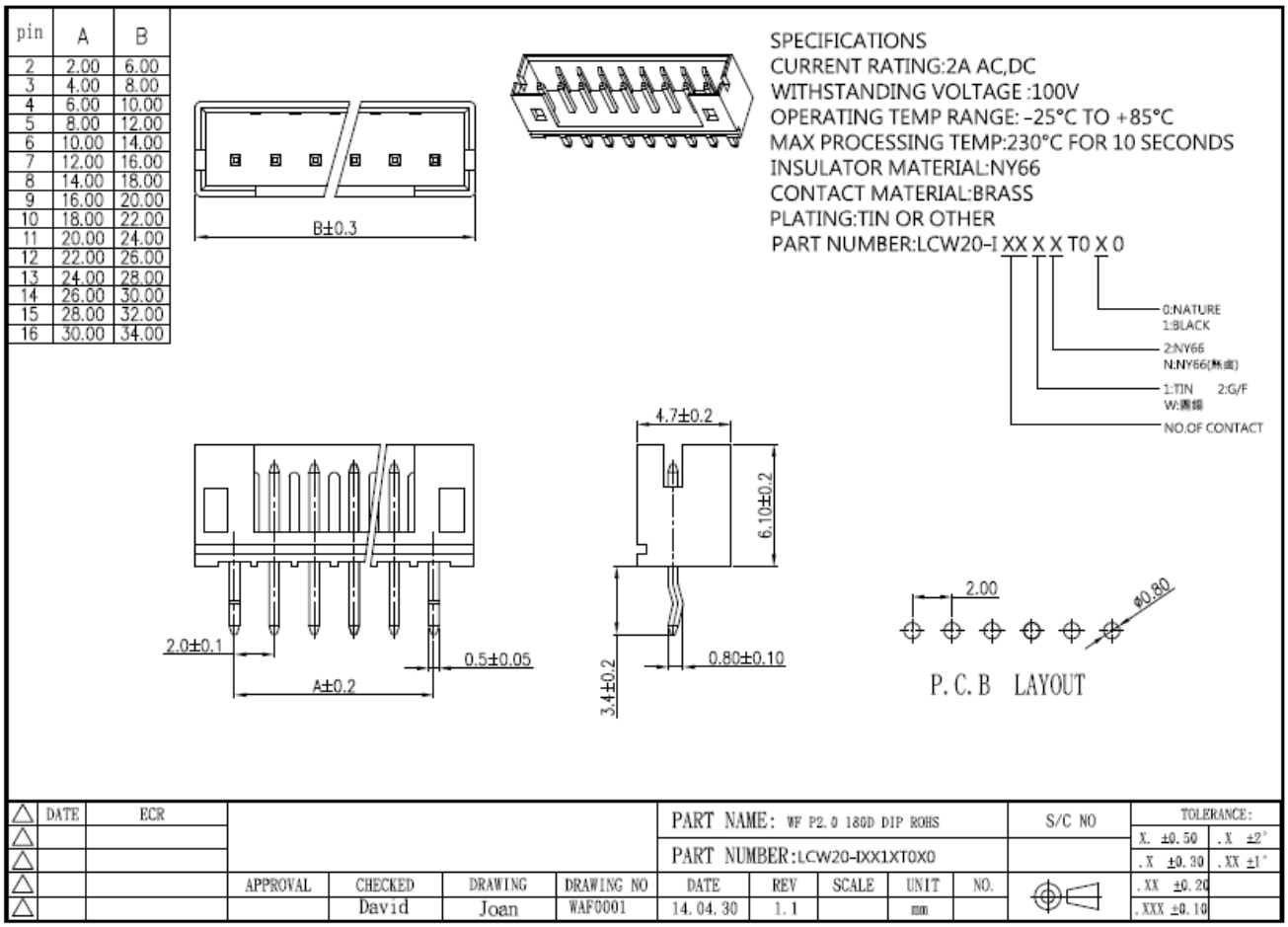


Figure 4: Wafer DIP 1*4P Connector Drawing (CN3)

Table 11 Wafer DIP 1*4P Pin Define (CN3)

Pin #	1	2	3	4
Signal Name	5V	GND	GND	12V

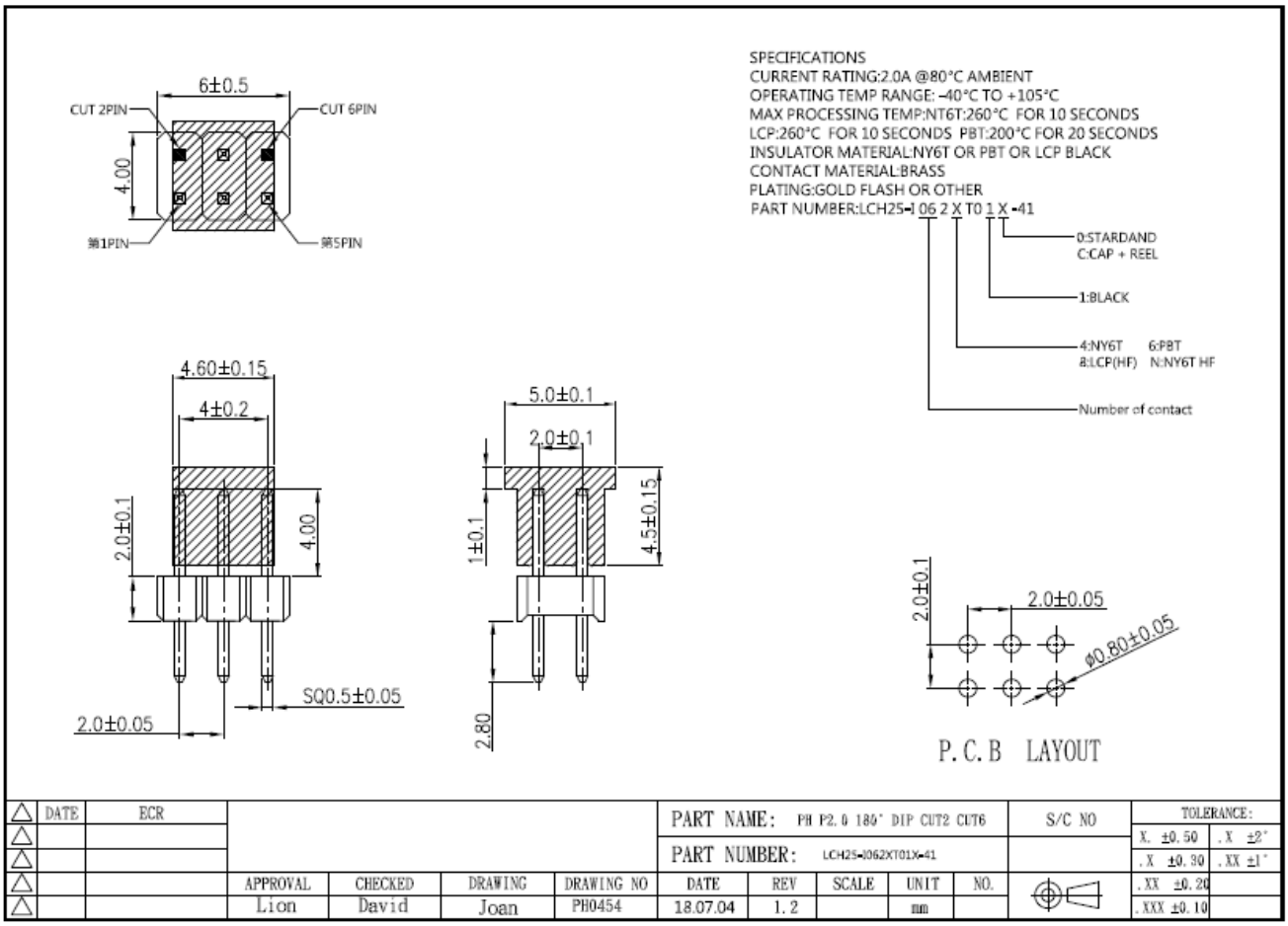
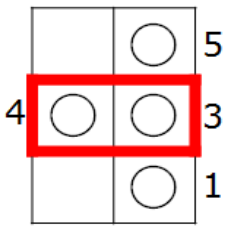
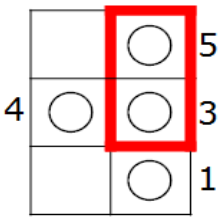
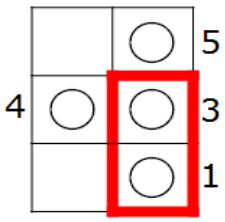
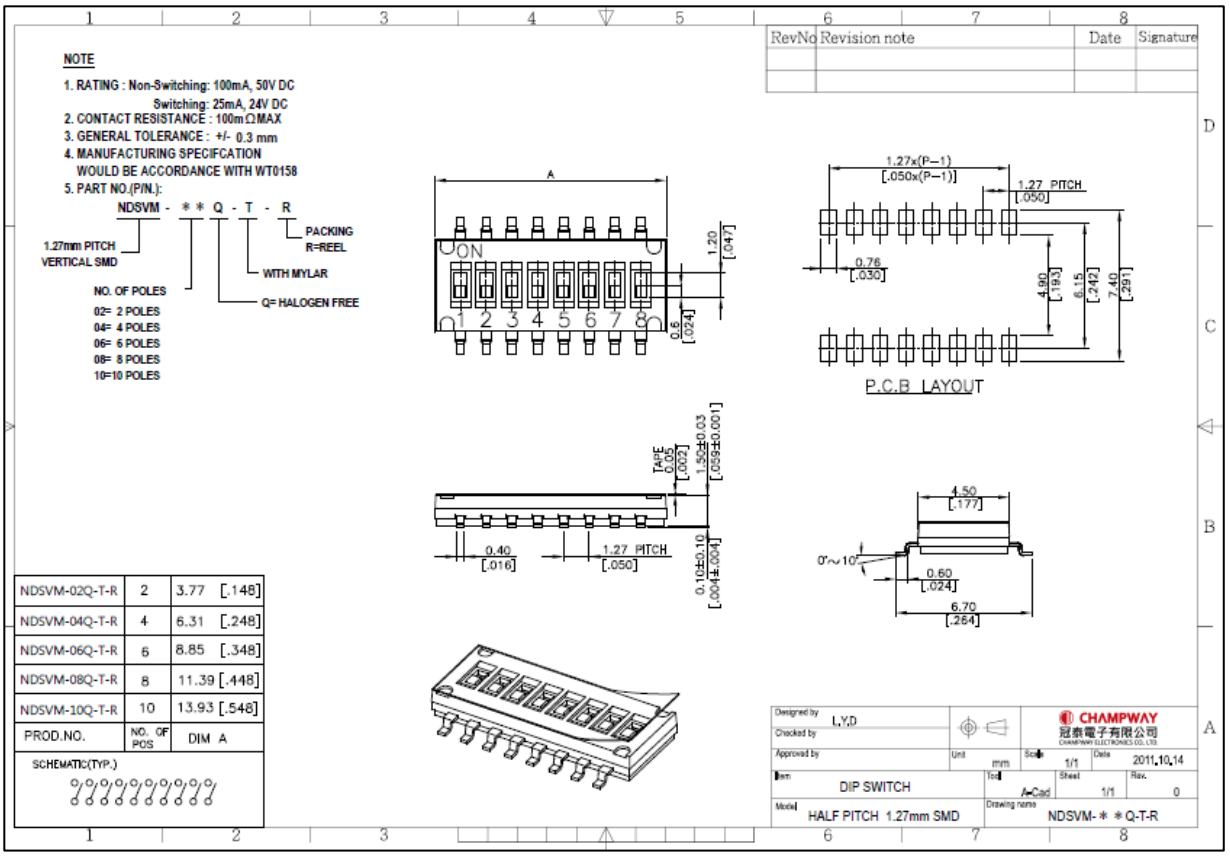


Figure 5: Pin Header DIP 2*3P(w/o pin2,6) Drawing (J1/J2/J3/J4)

Table 12: Pin Header DIP 2*3P(w/o pin2,6) Jumper Setting (J1/J2/J4/J4)

RI	5V	12V
		



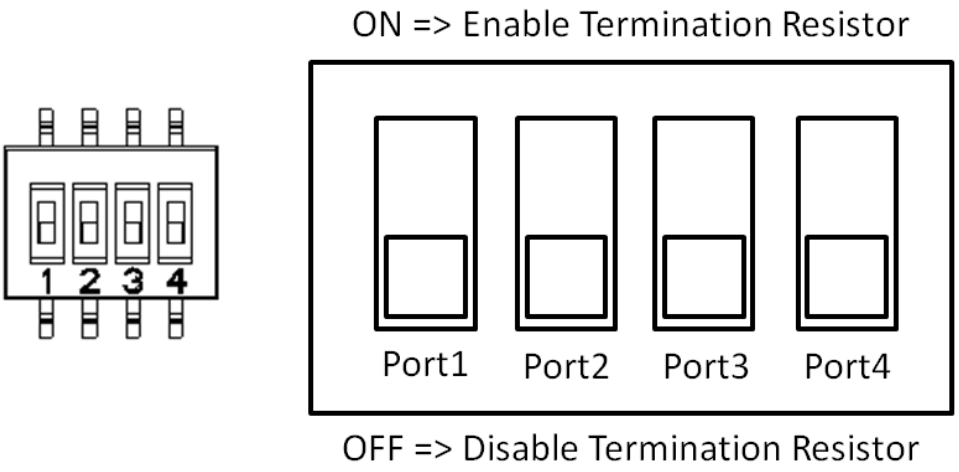


Figure 6: DIP Switch 8pin Drawing (SW1)

2.7.4. EMP2-X404 Mechanical Drawing

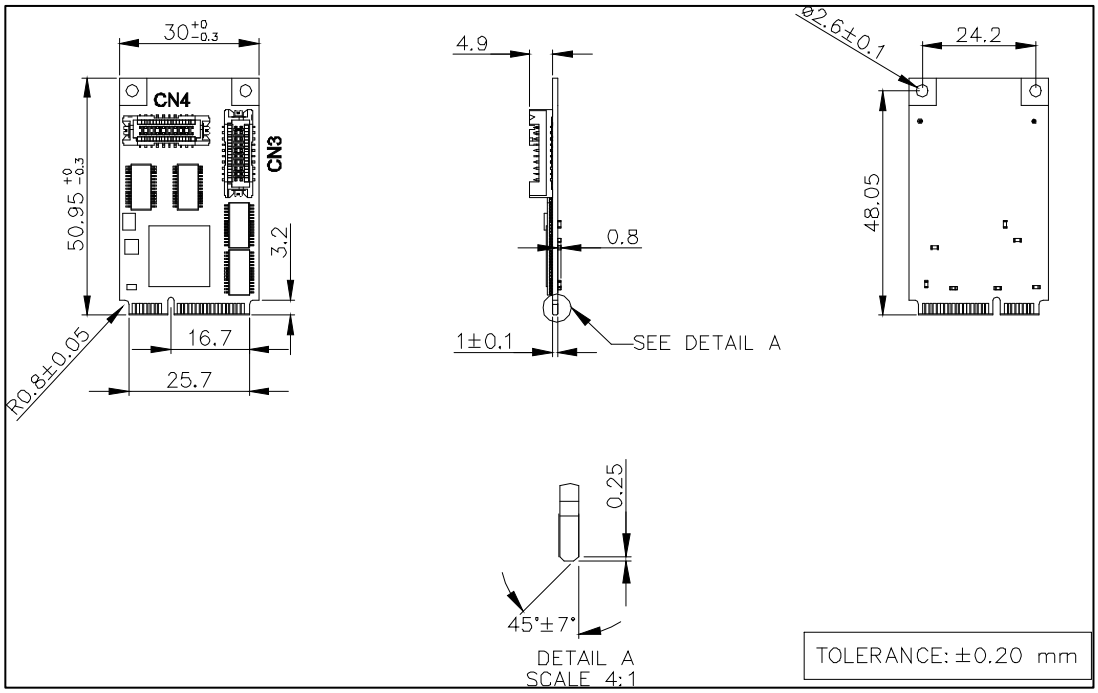
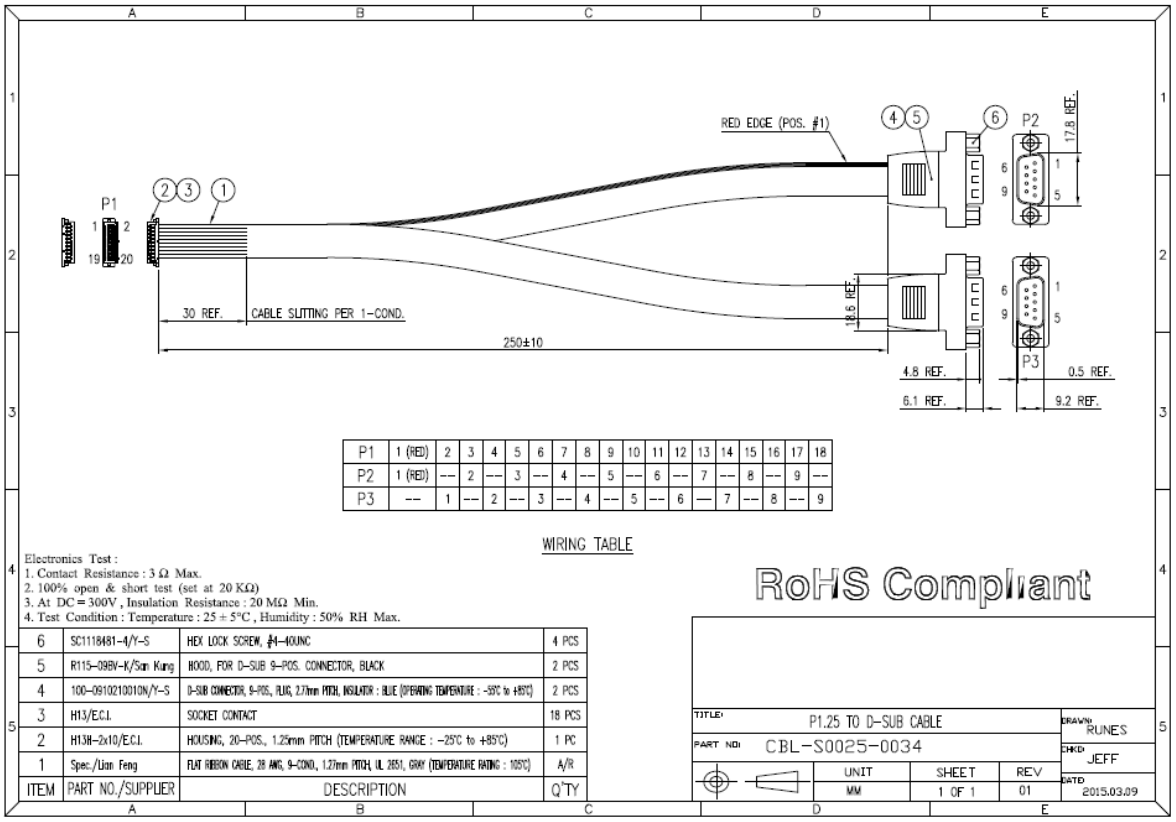


Figure 7: EMP2-X404 Drawing

2.7.5. Cable Mechanical Drawing & Pin defines



P1	1 (RED)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
P2	1 (RED)	---	2	---	3	---	4	---	5	---	6	---	7	---	8	---	9	---
P3	---	1	---	2	---	3	---	4	---	5	---	6	---	7	---	8	---	9

ITEM	PART NO./SUPPLIER	DESCRIPTION	Q'TY
6	SC1118481-4/Y-S	HEX LOCK SCREW, #4-40UNC	4 PCS
5	R115-098V-K/San Kung	HOOD, FOR D-SUB 9-POS. CONNECTOR, BLACK	2 PCS
4	100-0910210010N/Y-S	D-SUB CONNECTOR, 9-POS, PLUG, 2.77mm PITCH, INSULATOR : BLUE (OPERATING TEMPERATURE : -55°C to +85°C)	2 PCS
3	H13/E.C.I.	SOCKET CONTACT	18 PCS
2	H13H-2x10/E.C.I.	HOUSING, 20-POS., 1.25mm PITCH (TEMPERATURE RANGE : -25°C to +85°C)	1 PC
1	Spec./Lian Feng	FLAT RIBBON CABLE, 28 AWG, 9-COND., 1.27mm PITCH, UL 2651, GRAY (TEMPERATURE RATING : 105°C)	A/R

Figure 8: DB9 Cable Drawing

Table 13: DB9 Cable Pin Define

Pin #	1	2	3	4	5	6	7	8	9
RS-232	CD	RXD	TXD	DTR	GND	DSR	RTS	CTS	RI/5V/12V
RS-422	TX-	TX+	RX+	RX-	GND				RI/5V/12V
RS-485	D-	D+			GND				RI/5V/12V

2.7.6. Packing List

- EMP2-X404 x1
- DB9 Cable x2

2.8. Software Support

- Windows: XP, Windows 7, 8 , 8.1, 10, WES7, CE7.0
- Linux: Kernel 2.6.x and above.(Linux source code for modification)

3. Installation Guide

Please download driver and user manual from Myinnodisk web site.
https://myinnodisk.innodisk.com/myinnodisk/Login.aspx

4. Appedix

宜鼎國際股份有限公司
Innodisk Corporation

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

REACH Declaration of Conformity

Manufacturer Product:All Innodisk EP 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: 15/01/2018**)。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: 15/01/2018**). 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： Randy Chien 簡川勝

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

Date 日期： 2018 / 02 / 08

宜鼎國際股份有限公司
Innodisk Corporation
Tel:(02)7703-3000 Fax:(02) 7703-3555 Internet: http://www.innodisk.com/

RoHS 自我宣告書(RoHS Declaration of Conformity)

Manufacturer Product: All Innodisk 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.

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： 2018 / 02 / 08

Certificate

Issue Date: November 18, 2015
Ref. Report No. ISL-15LE550CE

Product Name : mPCIe to RS232/422/485 Module
Model(s) : E%P2-X#04
(%: 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)
#: Output items: (1:1Port, 2:2Ports, 3:3Ports, 4:4Ports, A~Z:TBD,X:Multi))
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. 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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☒ **Lung-Tan LAB:**
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Tao Yuan City 325, Taiwan
Tel: 886-3-407-1718; Fax: 886-3-407-1738

Certificate

Issue Date: November 18, 2015
Ref. Report No. ISL-15LE550FB

Product Name : mPCIe to RS232/422/485 Module
Model(s) : E%P2-X#04
(%: 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)
#: Output items: (1:1Port, 2:2Ports, 3:3Ports, 4:4Ports, A~Z:TBD,X:Multi))
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 C63.4-2009
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

W.H. Chang / Director

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December 15, 2021