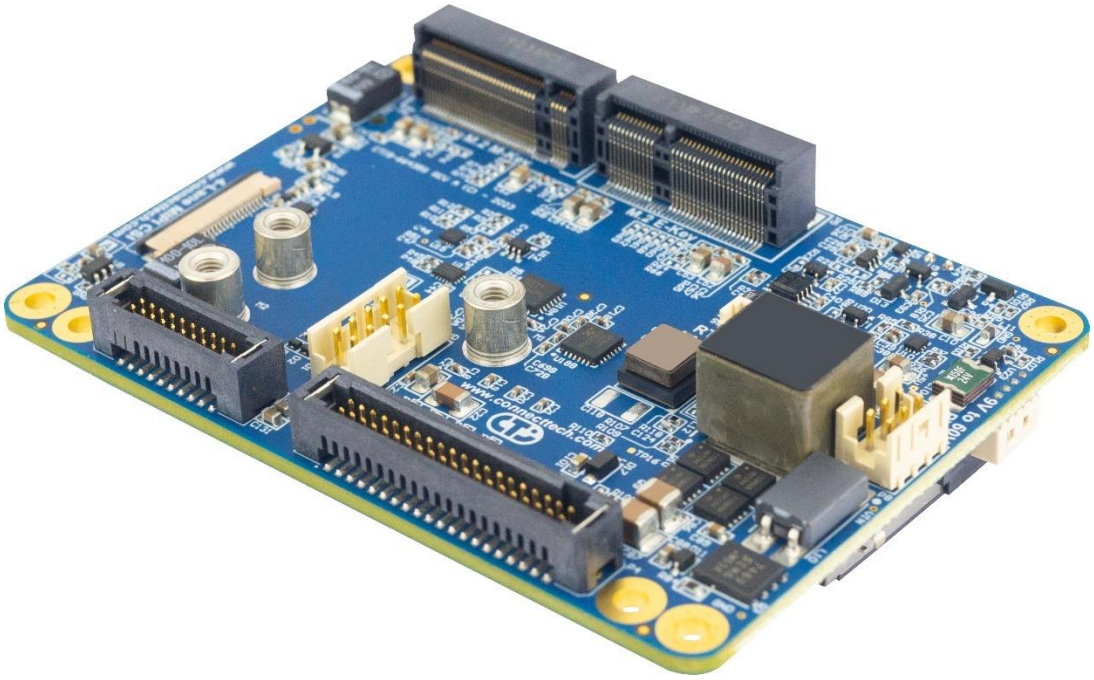
Connect Tech Inc.
Embedded Computing Experts

# USERS GUIDE



# Hadron Carrier

**CTIM-00088(0.07) 2023-10-19**

NVIDIA. ELITE PARTNER

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# PREFACE

## Disclaimer

The information contained within this user's guide, including but not limited to any product specification, is subject to change without notice.

Connect Tech assumes no liability for any damages incurred directly or indirectly from any technical or typographical errors or omissions contained herein or for discrepancies between the product and the user's guide.

## Customer Support Overview

If you experience difficulties after reading the manual and/or using the product, contact the Connect Tech reseller from which you purchased the product. In most cases the reseller can help you with product installation and difficulties.

In the event that the reseller is unable to resolve your problem, our highly qualified support staff can assist you. Our support section is available 24 hours a day, 7 days a week on our website at: https://connecttech.com/support/resource-center/. See the contact information section below for more information on how to contact us directly. Our technical support is always free.

## Contact Information

| Contact Information | |
|---|---|
| **Mail/Courier** | Connect Tech Inc.<br>Technical Support<br>489 Clair Road West<br>Guelph, Ontario<br>Canada N1L 0H7 |
| **Contact Information** | sales@connecttech.com<br>support@connecttech.com<br>www.connecttech.com<br>Toll Free: 800-426-8979 (North America only)<br>Telephone: +1-519-836-1291<br>Facsimile: 519-836-4878 (on-line 24 hours) |
| **Support** | Please go to the Connect Tech Resource Center for product manuals, installation guides, device drivers, BSPs and technical tips.<br><br>Submit your technical support questions to our support engineers. Technical Support representatives are available Monday through Friday, from 8:30 a.m. to 5:00 p.m. Eastern Standard Time. |

## Limited Product Warranty

Connect Tech Inc. provides a one-year Warranty for this product. Should this product, in Connect Tech Inc.'s opinion, fail to be in good working order during the warranty period, Connect Tech Inc. will, at its option, repair or replace this product at no charge, provided that the product has not been subjected to abuse, misuse, accident, disaster or non-Connect Tech Inc. authorized modification or repair.

You may obtain warranty service by delivering this product to an authorized Connect Tech Inc. business partner or to Connect Tech Inc. along with proof of purchase. Product returned to Connect Tech Inc. must be pre-authorized by Connect Tech Inc. with an RMA (Return Material Authorization) number marked on the outside of the package and sent prepaid, insured and packaged for safe shipment. Connect Tech Inc. will return this product by prepaid ground shipment service.

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## ESD Warning

Electronic components and circuits are sensitive to Electrostatic Discharge (ESD). When handling any circuit board assemblies including Connect Tech COM Express carrier assemblies, it is recommended that ESD safety precautions be observed. ESD safe best practices include, but are not limited to:

- Leaving circuit boards in their antistatic packaging until they are ready to be installed.
- Using a grounded wrist strap when handling circuit boards, at a minimum you should touch a grounded metal object to dissipate any static charge that may be present on you.
- Only handling circuit boards in ESD safe areas, which may include ESD floor and table mats, wrist strap stations and ESD safe lab coats.
- Avoiding handling circuit boards in carpeted areas.
- Try to handle the board by the edges, avoiding contact with components.

# REVISION HISTORY

| Revision | Date | Changes |
|---|---|---|
| 0.00 | 2023-03-21 | Preliminary Release |
| 0.01 | 2023-04-13 | Added mechanical details, GPIO and USB information |
| 0.02 | 2023-04-24 | Update USB connector information |
| 0.03 | 2023-05-26 | Added list of components for cable assembly |
| 0.04 | 2023-08-22 | Camera I2C Pinout Updated<br>Notes added for PCIe Gen#<br>USB Pinout – Typo Fixed<br>Host / Device Mode Switch – Description updated<br>Product Feature and Description – USB Feature updated<br>Typical Installation – Cable list updated<br>Reset and Recovery Jumper – Description Updated<br>CBG615 – Description updated |
| 0.05 | 2023-09-25 | USB Notes – Per port power values updated<br>CBG686, XBG023 added to Cable Information Table |
| 0.06 | 2023-10-19 | Corrected M.2 M-Key typo |
| 0.07 | 2024-01-31 | Current Consumption: Details updated for Orin NX<br>Mechanical Details: XBG023 Assembly instruction added<br>SYS_ON LED notes updated |

# INTRODUCTION

Connect Tech's Hadron platform brings a low cost deployable Jetson solution to the market. The Hadron's design includes 1x Gigabit Ethernet, 2 x USB 3.1 (when using NVIDIA® Jetson Orin™ NX), 1 x MIPI CSI-2 (4 lane), 4x GPIOs (2x PWM capable), 3x UART, 1x I2C, 1x SPI.

## Product Feature and Specifications

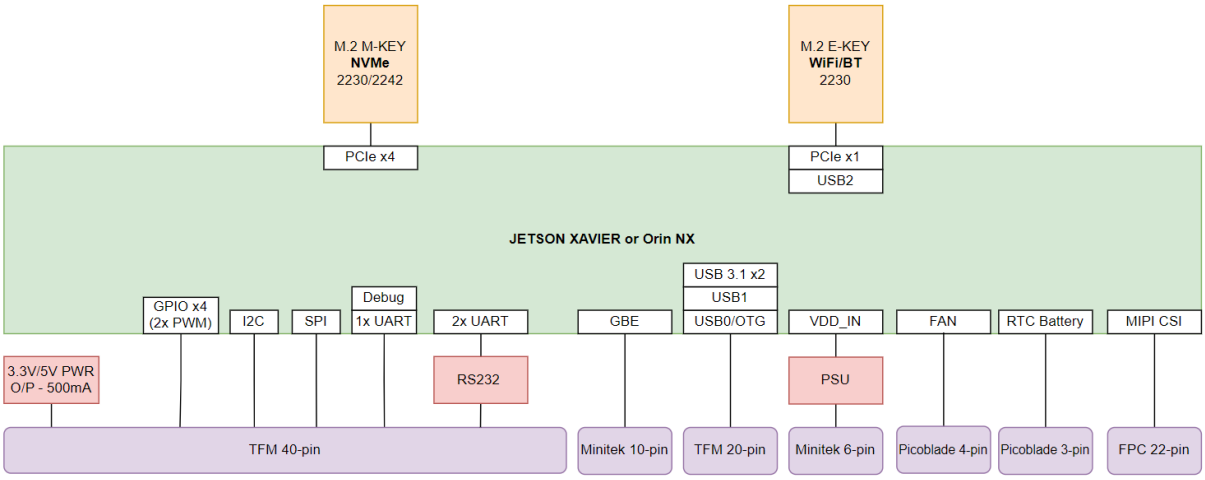
| Feature | Description |
|---|---|
| **Module Compatibility** | NVIDIA® Jetson Xavier™ NX<br>NVIDIA® Jetson Orin™ NX<br>NVIDIA® Jetson Orin™ Nano |
| **Mechanical Dimensions** | 82.65mm x 58.8mm (3.25" x 2.31") |
| **USB** | 2x USB 3.1 Gen<br>• 1x USB 3.0 Host Only<br>• 1x USB 3.0 Dual Function – Host / Device mode (Selectable by S1 switch)<br>Note – Dual Function port will be used when the system enters Force Recovery Mode |
| **MIPI Cameras** | 1x 4-lane MIPI CSI-2 (2-lane support available with 22-to-15 pin FFC/FPC cable)<br>Connector P/N: 54548-2271<br>22-pin FPC 0.5mm Pitch Connector |
| **Storage** | 1x M.2 M-Key (NVMe) expansion slot (4 lane PCIe Gen 4)<br>Support for 2242 and 2230 sized NVMe |
| **IO – Ethernet** | 1x 10/100/1000BASE-T Uplink |
| **IO – UART Debug** | 1x Debug UART (I/O header) |
| **IO – UART** | 2x RS-232 (I/O header) |
| **IO – I2C** | 1x I2C bus (I/O header) |
| **IO – SPI** | 1x SPI bus (I/O header) |
| **IO – GPIO / PWM** | 4x GPIO (I/O header) – 2x PWM Capable |
| **User Expansion** | 1x M.2 Key-E Expansion Slot (1 lane PCIe Gen 3, USB 2.0)<br>For Wi-Fi/Bluetooth modules |
| **RTC Battery** | 3-Pin RTC Battery Connector |
| **Input Power** | +9V to +60V DC Wide Input Power (6-pin Minitek Connector) |
| **Operating Temperature** | -25°C to +85°C (-13°F to +185°F) |
| **Weight** | 49 grams |
| **Warranty and Support** | 1 Year Warranty and Free Support |

## Part Numbers / Ordering Information

| Part Number | Description |
|---|---|
| NGX012 | Hadron Carrier Only |
| XBG023 | USB 3.0 Breakout Board |

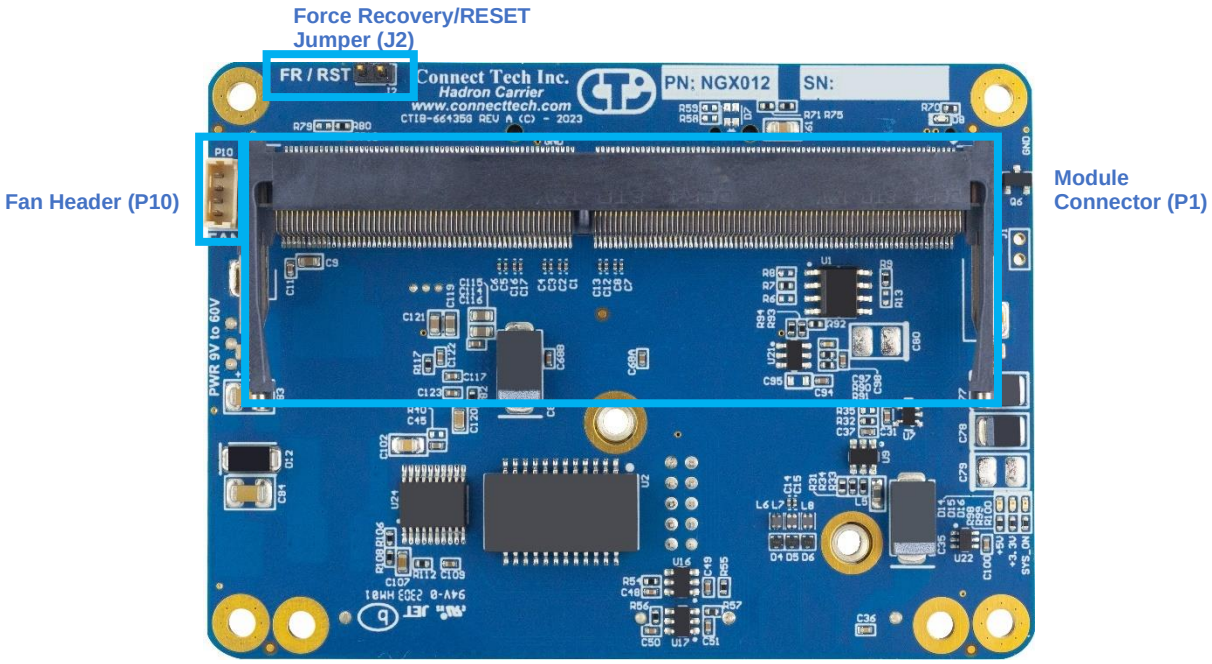
# PRODUCT OVERVIEW

## Block Diagram

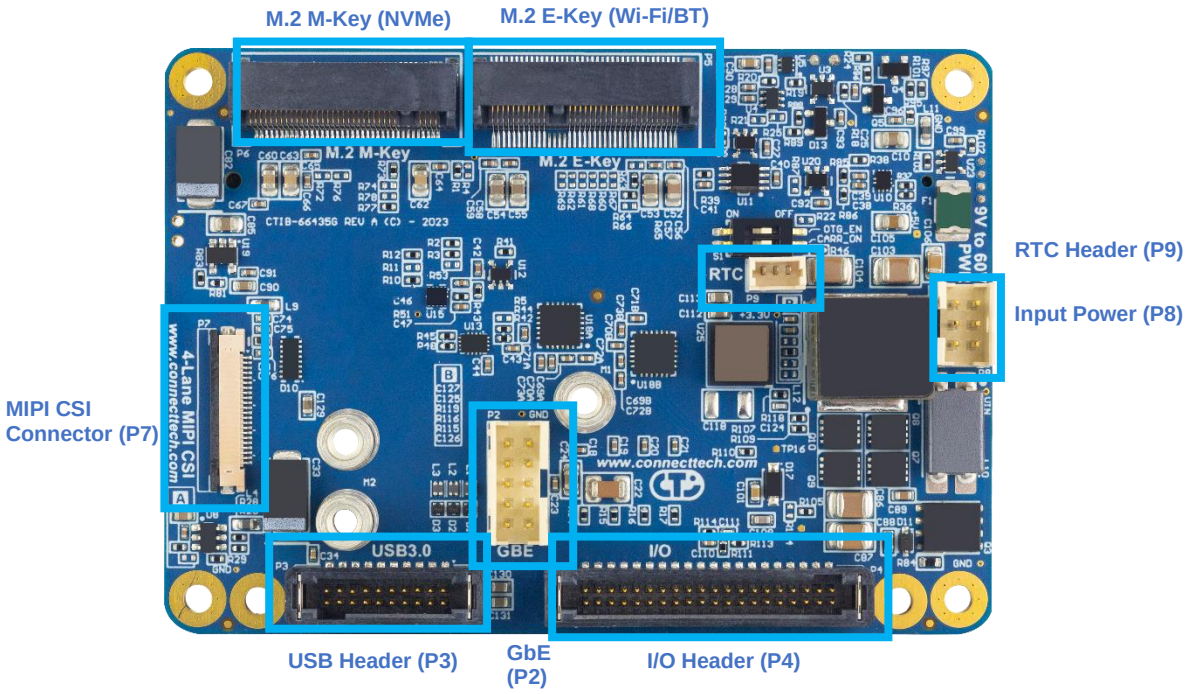


# Connector Locations

**Top View**




**Bottom View**



## Connector Summary

| Designator | Connector | Description |
|---|---|---|
| P1 | 2309413-1 | Module Board-To-Board Connector for:<br>• NVIDIA® Jetson Xavier™ NX<br>• NVIDIA® Jetson Orin™ NX |
| P2 | 98414-G06-10LF | GbE Connector |
| P3 | TFM-110-02-L-D-WT | Dual Port USB 3.0 Connector |
| P4 | TFM-120-02-L-D-WT | I/O Header |
| P5 | 10128797-004RLF | M.2 E-Key Connector |
| P6 | 10131758-001RLF | M.2 M-Key (NVMe) Connector |
| P7 | 54548-2271 | 4-lane MIPI CSI-2 Camera Connector |
| P8 | 98414-G06-06LF | Input Power Connector |
| P9 | 53047-0310 | 3-pin RTC Battery Connector |
| P10 | 53047-0410 | 5V Fan Connector |

## Jumper and Switch Summary

| Designator | Connector | Description |
|---|---|---|
| S1 | 1571983-1 | Host Mode / Device Mode Selection Switch |
| J2 | HTSW-102-08-G-S | Force Recovery/Reset Jumper Block |

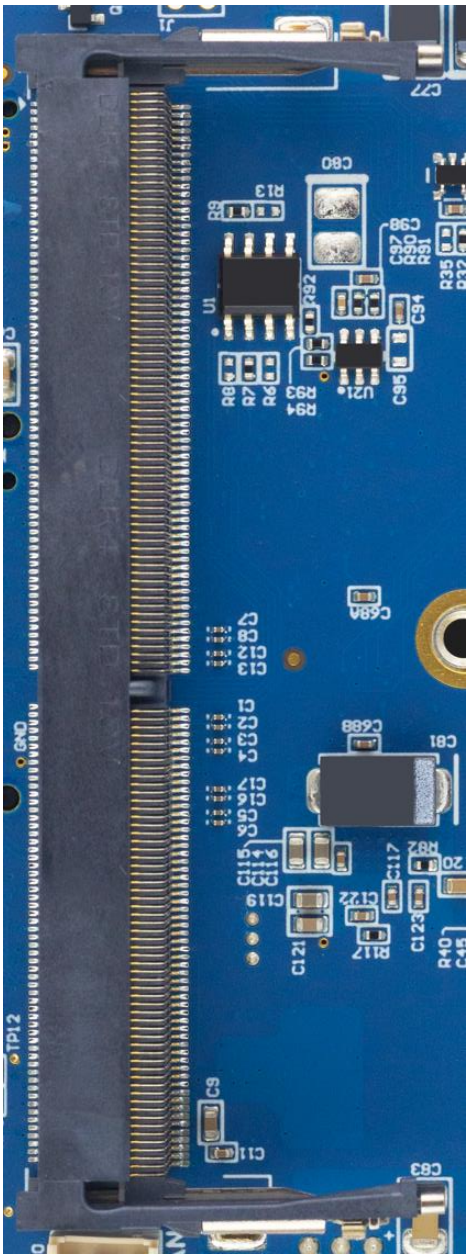
# DETAILED FEATURE DESCRIPTION

## Jetson Orin™ / Xavier™ NX Module Connector

### Description

The NVIDIA® Jetson Orin™ / NVIDIA® Jetson Xavier™ NX processor and chipset are implemented on the Jetson Orin™ NX / Jetson Xavier™ NX Module. This connects to the Hadron Carrier via a TE Connectivity DDR4 SODIMM 260 Pin connector.

| Function | Description |
|---|---|
| **Location** | P1 |
| **Type** | TE Connectivity DDR4 SODIMM 260 Pin |
| **Carrier Connector** | Part Number: 2309413-1<br>Manufacturer: TE Connectivity |
| **Mating Connector** | Jetson Orin™ NX /Jetson Xavier™ NX Module |
| **Pinout** | Refer to NVIDIA®'s Jetson Orin ™ NX or<br>Jetson Xavier™ NX System-On-Module datasheet for pinout details<br><br>https://developer.nvidia.com/embedded/downloads |
| **Board-to-Module Standoff Height** | M2.5 x 6.57mm standoffs required between<br>NVIDIA® Jetson Orin™ NX or<br>NVIDIA® Jetson Xavier™ NX Module and Hadron Carrier |

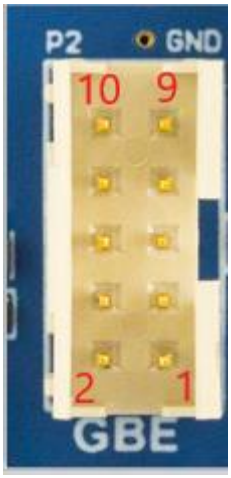


# 10/100/1000 Ethernet Connectors

## Description

The NVIDIA® Jetson Orin™ NX/ NVIDIA® Jetson Xavier™ NX module will allow internet communication via GbE connector as below.

| Function | Description |
|---|---|
| **Location** | P2 |
| **Ethernet Usage** | Jetson Onboard Ethernet |
| **Type** | 10 pin RA connector |
| **Carrier Connector** | Part Number: 98414-G06-10LF<br>Manufacturer: Amphenol ICC |
| **Mating Connector** | 90311-010LF |
| **Mating CTI Cable** | CBG117 |
| **Pinout** | |
| **Pin 1** | MDI0_N |
| **Pin 2** | MDI0_P |
| **Pin 3** | MDI1_N |
| **Pin 4** | MDI1_P |
| **Pin 5** | GBE_GND (Shield) |
| **Pin 6** | GBE_GND (Shield) |
| **Pin 7** | MDI2_N |
| **Pin 8** | MDI2_P |
| **Pin 9** | MDI3_N |
| **Pin 10** | MDI3_P |



## USB 3.1 Connector

| Function | Description |
|---|---|
| **Location** | P3 |
| **Type** | Tiger Eye 20 Pin Connector, 0.05mm Pitch |
| **Carrier Connector** | Part Number: TFM-110-02-L-D-WT<br>Manufacturer: Samtec |
| **Mating Cables** | CBG615 (USB 2.0 only), CBG686 (USB3.0), XBG023 |
| **Pinout** | |
| **Pin 1** | GND |
| **Pin 2** | USB1_D_P |
| **Pin 3** | USB0_D_P |
| **Pin 4** | USB1_D_N |
| **Pin 5** | USB0_D_N |
| **Pin 6** | GND |
| **Pin 7** | GND |
| **Pin 8** | USB3_P1_TX_P |
| **Pin 9** | USB3_P0_TX_P |
| **Pin 10** | USB3_P1_TX_N |
| **Pin 11** | USB3_P0_TX_N |
| **Pin 12** | GND |
| **Pin 13** | GND |
| **Pin 14** | USB3_P1_RX_P |
| **Pin 15** | USB3_P0_RX_P |
| **Pin 16** | USB3_P1_RX_N |
| **Pin 17** | USB3_P0_RX_N |
| **Pin 18** | USB1 VBUS |
| **Pin 19** | USB0 VBUS |
| **Pin 20** | GND |
| Notes | Both ports will only be USB 3.1 capable when using Jetson Orin™ NX. Only Port 0 will be USB 3.1 capable when using Jetson Xavier™ NX.<br><br>Maximum power available on each individual port is as below:<br>Hadron Rev A, Rev B = 1A per port<br>Hadron Rev C and onwards = 2A per port |

# I/O Header

## Description

The Hadron Carrier implements a TFM-120-02-L-D-WT Connector to allow access for additional GPIO and interfaces.

| Function | Description |
|---|---|
| **Location** | P4 |
| **Type** | Samtec 40Pin Connector, 1.27mm Pitch |
| **Carrier Connector** | Part Number: TFM-120-02-L-D-WT<br>Manufacturer: Samtec |
| **Mating Cable/Connector** | CBG629 / SFSD-20-28C-G-12.00-SR<br>Manufacturer: Samtec |


**Pinout**

| Description | Signal Name | Pins | | Signal Name | Description |
|---|---|---|---|---|---|
| Signal Ground | GND | **1** | **2** | GND | Signal Ground |
| GPIO10 | GPIO10 | **3** | **4** | GPIO13 | GPIO13 (PWM) |
| GPIO11 | GPIO11 | **5** | **6** | GPIO12 | GPIO12 (PWM) |
| Signal Ground | GND | **7** | **8** | GND | Signal Ground |
| +5V Power Out[1] | +5V_IO | **9** | **10** | +3.3V_IO | +3.3V Power Out[1] |
| +5V Power Out[1] | +5V_IO | **11** | **12** | +3.3V_IO | +3.3V Power Out[1] |
| Signal Ground | GND | **13** | **14** | GND | Signal Ground |
| SPI0 Transmit | SPI0 MOSI | **15** | **16** | SPI0 SCK | SPI0 Clock |
| SPI0 Receive | SPI0 MISO | **17** | **18** | SPI0 CS0 | SPI0 Chip Select |
| Signal Ground | GND | **19** | **20** | GND | Signal Ground |
| RS-232_0 Request to Send | RS-232_0_RTS | **21** | **22** | RS-232_0_TX | RS-232_0 Transmit |
| RS-232_0 Clear to Send | RS-232_0_CTS | **23** | **24** | RS-232_0_RX | RS-232_0 Receive |
| Signal Ground | GND | **25** | **26** | GND | Signal Ground |
| RS-232_1 Transmit | RS-232_1_TX | **27** | **28** | RS-232_1_RTS | RS-232_1 Request to Send |
| RS-232_1 Receive | RS-232_1_RX | **29** | **30** | RS-232_1_CTS | RS-232_1 Clear to Send |
| Signal Ground | GND | **31** | **32** | GND | Signal Ground |
| I2C0 Clock | I2C 0 SCL | **33** | **34** | I2C 0 SDA | I2C0 Data |
| Signal Ground | GND | **35** | **36** | GND | Signal Ground |
| Debug UART RX | UART2_RX | **37** | **38** | UART2_TX | Debug UART TX |
| Signal Ground | GND | **39** | **40** | GND | Signal Ground |

**Notes**

**Xavier™ NX SW Interface Cross Reference**

| Signal Name | Module ID | Controller ID |
|---|---|---|
| GPIO07 | GPIO07 | PR.00 |
| GPIO10 | GPIO10 | PQ.01 |
| GPIO11 | GPIO11 | PQ/06 |
| GPIO12 | GPIO12 | PCC/04 |
| GPIO13 (PWM) | C280000.pwm | pwmchip0 |
| GPIO12 (PWM) | c340000.pwm | pwmchip1 |

| Signal Name | SW/Dev ID | DTB ID |
|---|---|---|
| I2C0 | i2c-1 | i2c@c240000 |
| RS232_0 | /dev/ttyTHS1 | serial@3110000 |
| RS232_1 | /dev/ttyTHS0 | serial@3100000 |
| SPI0 | /dev/spidev0.0 | spi@3210000 |

**Orin™ NX SW Interface cross Reference**

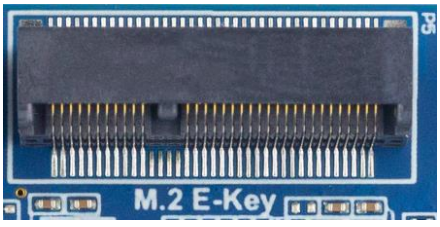
| Signal Name | Module ID | Controller ID |
|---|---|---|
| GPIO07 | GPIO07 | PG.06 |
| GPIO10 | GPIO10 | PEE.02 |
| GPIO11 | GPIO11 | PQ.06 |
| GPIO12 | GPIO12 | PN.01 |
| GPIO13 (PWM) | 32c0000.pwm | pwmchip2 |
| GPIO12 (PWM) | 3280000.pwm | pwmchip0 |

| Signal Name | SW/Dev ID | DTB ID |
|---|---|---|
| I2C0 | i2c-1 | I2c@c240000 |
| RS232_0 | /dev/ttyTHS1 | serial@3110000 |
| RS232_1 | /dev/ttyTHS0 | serial@3100000 |
| SPI0 | /dev/spidev0.0 | spi@3210000 |

1. +3.3V and +5V power pins are outputs only, **DO NOT** feed power to these pins
2. GPIO are 3.3V

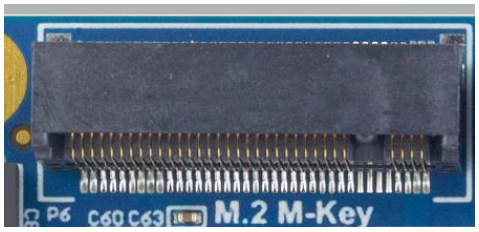
## M.2 E-Key – Wi-Fi and Bluetooth Expansion Port

| Function | Description |
|---|---|
| **Location** | P5 |
| **Type** | 67 Pin M.2 Connector with M2.5 Mounting Standoff |
| **Connector** | Part Number: 10128797-004RLF<br>Manufacturer: Amphenol ICC |
| **Pinout** | As per the M.2 E-key specification |
| **Notes** | This port contains a x1 PCIe Gen 1 interface and one USB 2.0 interface.<br>* PCIe Gen# is based on available equipment and their testing with Hadron Carrier. |



## M.2 M-Key – NVMe

| Function | Description |
|---|---|
| **Location** | P6 |
| **Type** | 67 Pin M.2 Connector with M2.5 Mounting Standoff |
| **Connector** | Part Number: 10131758-001RLF<br>Manufacturer: Amphenol ICC |
| **Pinout** | As per the M.2 M-key specification |
| **Notes** | Interface is x4 PCIe Gen 4. Support for M.2 2230 and 2242 sizes only.<br>* PCIe Gen# is based on available equipment and their testing with Hadron Carrier. |




## MIPI CSI-2 Connectors

### Description

The NVIDIA® Jetson Orin™ NX/ NVIDIA® Jetson Xavier™ NX module will allow 2-lane or 4-Lane MIPI video input via the Right-Angle FPC connector. 2-lane support for 15-pin cameras if used with a 22-to-15 pin FFC/FPC cable.

| Function | Description |
|---|---|
| **Location** | P7 |
| **MIPI Lane usage** | CSI0 |
| **Type** | MOLEX FPC Right Angle Connector<br>22 Pin |
| **Carrier Connector** | Part Number: 54548-2272<br>Manufacturer: Molex |
| **Pinout** | |
| **Pin 1** | +3.3V |
| **Pin 2** | CAM1_I2C_SDA |
| **Pin 3** | CAM1_I2C_SCL |
| **Pin 4** | GND |
| **Pin 5** | CAM1_MCLK |
| **Pin 6** | CAM1_PWDN |
| **Pin 7** | GND |
| **Pin 8** | CSI1_D1_P |
| **Pin 9** | CSI1_D1_N |
| **Pin 10** | GND |

| | | |
|---|---|---|
| **Pin 11** | CSI1_D0_P | |
| **Pin 12** | CSI1_D0_N | |
| **Pin 13** | GND | |
| **Pin 14** | CSI0_CLK_P | |
| **Pin 15** | CSI0_CLK_N | |
| **Pin 16** | GND | |
| **Pin 17** | CSI0_D1_P | |
| **Pin 18** | CSI0_D1_N | |
| **Pin 19** | GND | |
| **Pin 20** | CSI0_D0_P | |
| **Pin 21** | CSI0_D0_N | |
| **Pin 22** | GND | |

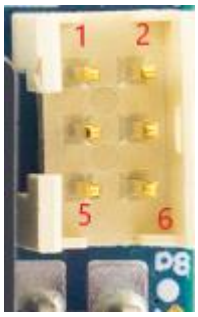
22-to-15 pin cable image reference

# Power Header

## Description

The Hadron Carrier implements a Power Connector using 98414-G06-06LF from Amphenol FCI.

| Function | Description |
|---|---|
| **Location** | P8 |
| **Type** | Amphenol FCI MiniTek Series Connector |
| **Carrier Connector** | 98414-G06-06LF |
| **Mating CTI Cable** | CBG112 |
| **Pinout** | |
| **Pin 1** | GND |
| **Pin 2** | GND |
| **Pin 3** | GND |
| **Pin 4** | +VIN |
| **Pin 5** | +VIN |
| **Pin 6** | +VIN |



## 3-Pin RTC Battery Connector

### Description

The Hadron Carrier implements a 3 Position Molex PicoBlade connector for connecting RTC battery.

| Function | Description |
|---|---|
| **Location** | P9 |
| **Type** | Molex 3 Position 1.25mm PicoBlade Connector |
| **Carrier Connector** | Part Number: 53047-0310<br>Manufacturer: Molex |
| **Mating Connector** | Molex 51021-0300 PicoBlade Connector |
| **Mating CTI Cable** | CBG136 |
| **Pinout** | |
| **Pin 1** | RTC Battery Positive (+ve) |
| **Pin 2** | Not Connect |
| **Pin 3** | RTC Battery Negative (-ve) |


## +5V Fan Connector

### Description

The Hadron Carrier implements a 4 Position Molex PicoBlade connector for active cooling capability.

| Function | Description |
|---|---|
| **Location** | P10 |
| **Type** | Molex 4 Position 1.25mm PicoBlade Connector |
| **Carrier Connector** | Part Number: 53047-0410<br>Manufacturer: Molex |
| **Mating Connector** | Molex 51021-0400 PicoBlade Connector |
| **Pinout** | |
| **Pin 1** | GND |
| **Pin 2** | +5V |
| **Pin 3** | FAN_TACH |
| **Pin 4** | FAN_PWM |

## Reset & Recovery Jumper

### Description

The Hadron Carrier implements a dual functionality jumper block for both Reset and Recovery of the platform. To Reset the module, simply connect the two pins on the jumper momentarily. To put the Jetson module into Force Recovery mode, install a jumper and then power on the platform. After 10 seconds remove the jumper shunt and the device will now be in Force Recovery mode.

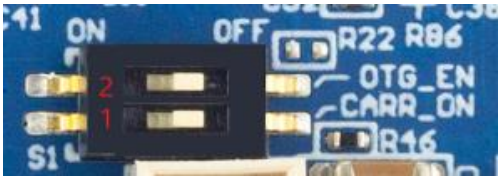
Once the device is in Force Recovery Mode, it can be detected using *lsusb* (or equivalent) command on the host computer.

| Function | Description |
|---|---|
| **Location** | J2 |
| **Type** | Jumper Block |
| **Carrier Connector** | HTSW-102-08-G-S<br>Manufacturer: Samtec |


**Note:** A full power cycle of the system must be performed after module flashing.

## USB Host / Device Mode and Power Switch

| Function | Description |
|---|---|
| **Location** | SW1 |
| **Type** | TE Connectivity 1571983-1 DIP Switch |
| **Carrier Connector** | Part Number: 1571983-1<br>Manufacturer: TE Connectivity<br>Product is shipped with both switches OFF |
| **S1-1** | Manufacturing use ONLY. Leave in OFF position for proper operation. |
| **S1-2** | On: USB Host Mode<br>Off: USB Device Mode |



# LED Indicators

## Description

The Hadron Carrier implements three LED's (D14, D15, D16) for power status indication as follows:

| Function | Description |
|---|---|
| **Location** | D14, D15, D16 |
| **Type** | Green LED |
| **Carrier Connector** | Part Number: APHHS1005CGCK<br>Manufacturer: Kingbright |
| **Function** | **LED** |
| **+5V** | D14 |
| **+3.3V** | D15 |
| **SYS_ON** | D16 |


Note: When an Orin NX module is not installed, SYS_ON is state is indeterminate.

# TYPICAL INSTALLATION

1. Ensure all external system power supplies are off and disconnected.
2. Install the NVIDIA® Jetson Orin™ NX/ NVIDIA® Jetson Xavier™ NX Module into the DDR4 260 Pin SODIMM Connector (P1).
   Be sure to follow the manufacturer's directions for proper installation of mounting hardware, heatsink / heat-spreader, and any other applicable requirements from the manufacturer.
3. Install the necessary cables based on your application:
   1. Connect Power cable to the input power connector (P8)
   2. Connect a 3.3V TTL FTDI Serial cable to UART2 pins on Pin 37 and Pin 38 of the I/O Header (P4)
   3. If network connectivity is required, plug-in CBG117 at P2
4. Connect the Power Cable of the Power Supply into the Power header (P8)
   Plug the AC cable of the Power Supply into the wall.
5. Access the debug UART port using a standard 3.3V TTL FTDI cable to any computer over USB. Another TTL UART interface is required to use the debug port. The default serial settings are 115200 8N1 (standard settings) but hardware flow control must be turned off.

   If using minicom in Linux based systems, serial into the system through disabling the hardware flow control:
   1. Press CTRL+A
   2. Press o
   3. Go to Serial Port Setup
   4. Press F (To change hardware flow control to off)
   5. (optional) save as default in previous menu

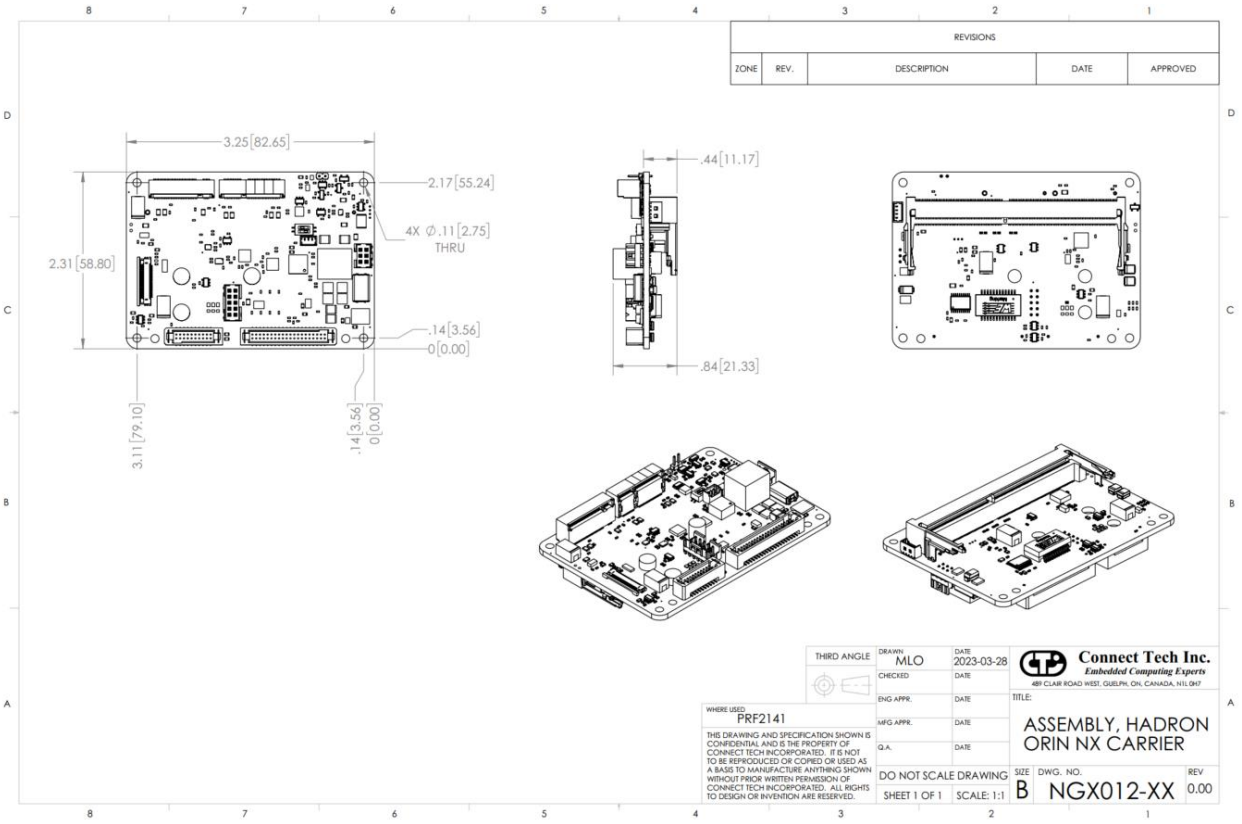
   If using putty in Windows based systems, in the left menu go to serial>flow control>None.

**DO NOT** power up your system by plugging in live power.

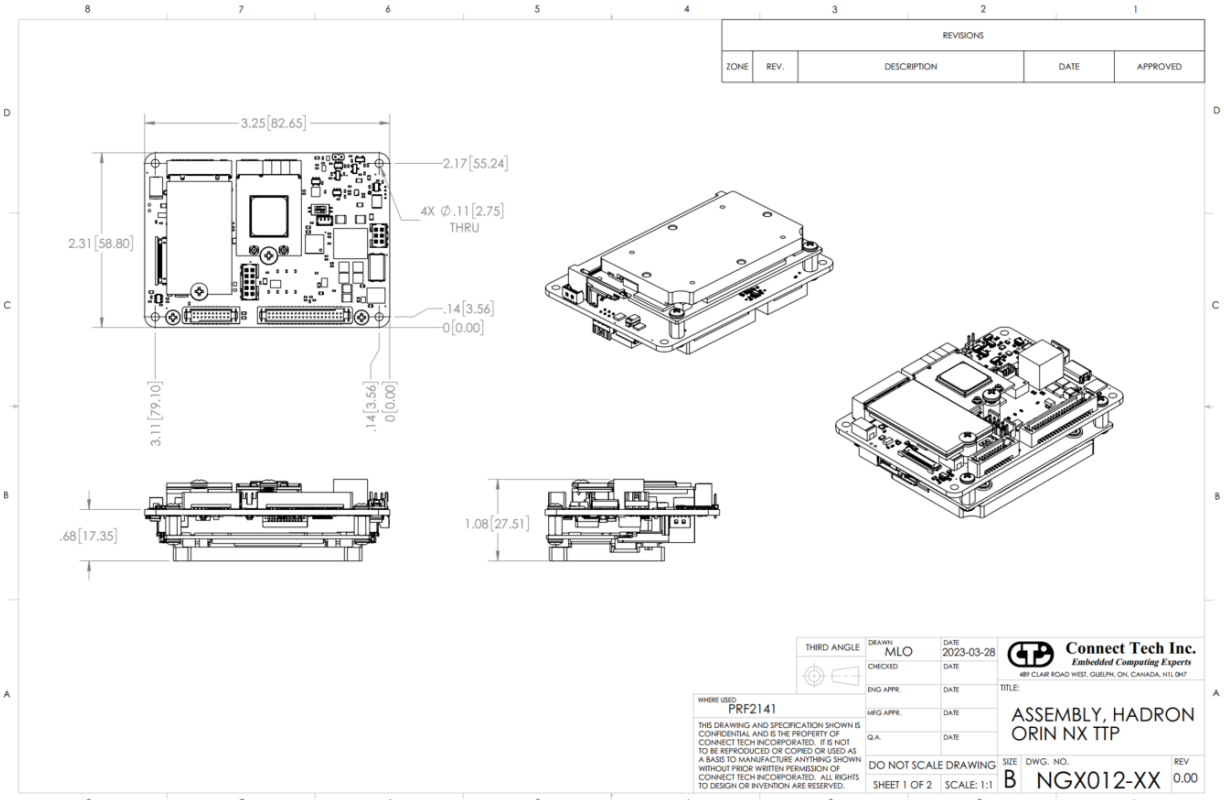
# MECHANICAL DETAILS

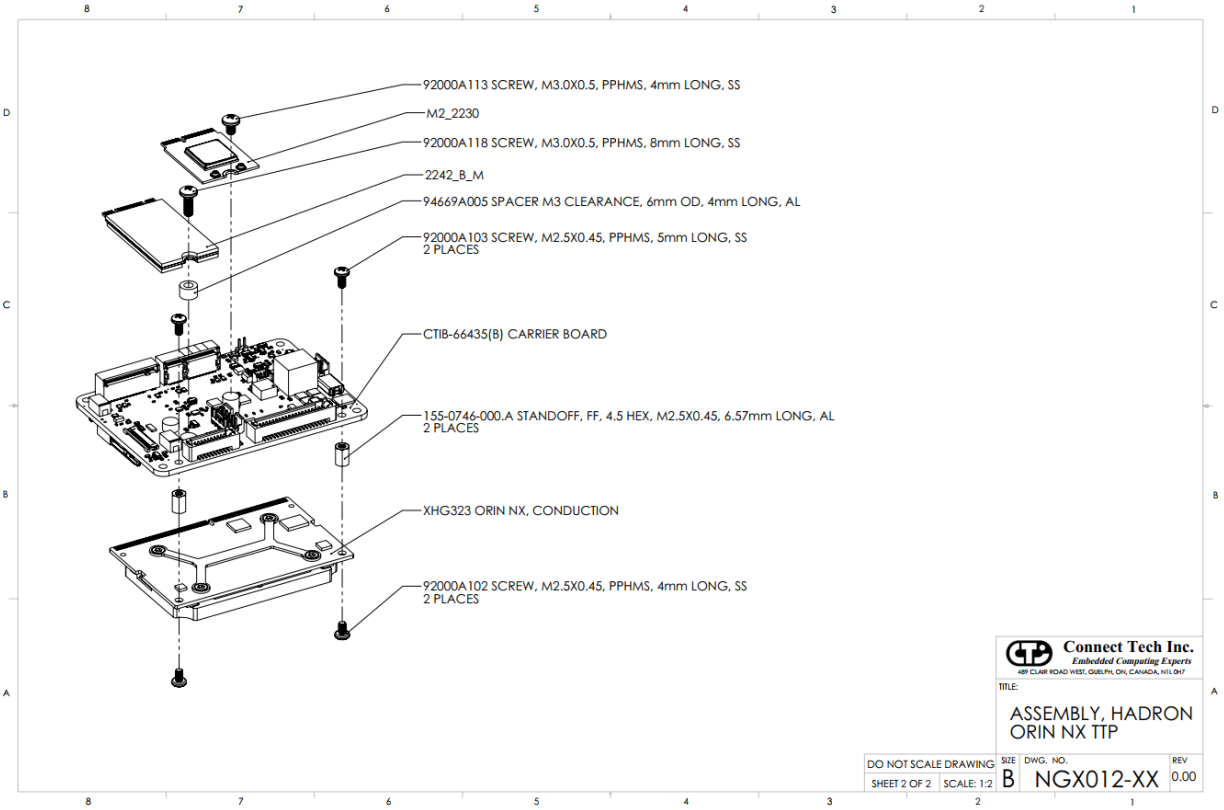
Full 3D Model of Hadron Carrier and XBG023 can be found here:
https://connecttech.com/ftp/3d_models/NGX012_3D_MODEL.zip
https://connecttech.com/ftp/3d_models/XBG023B_3D_Model.zip

**NGX012 – Hadron - Stand Alone Drawings**

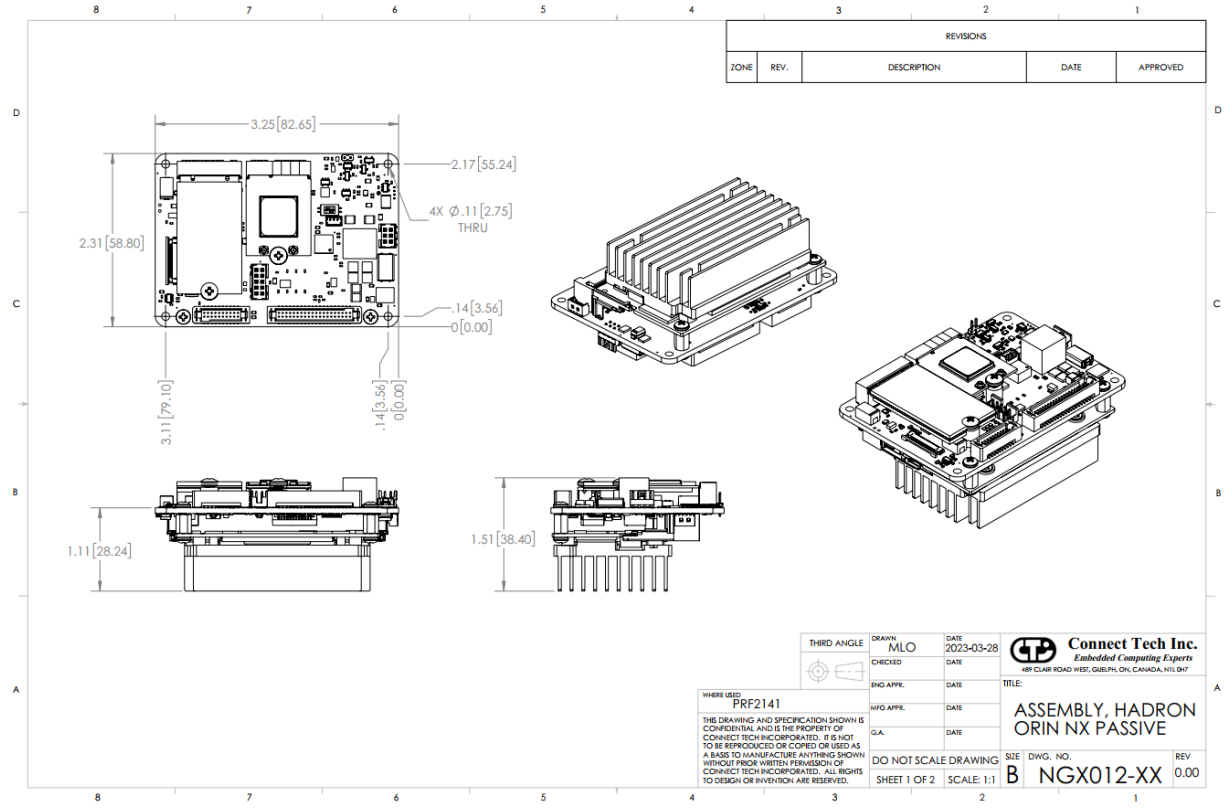


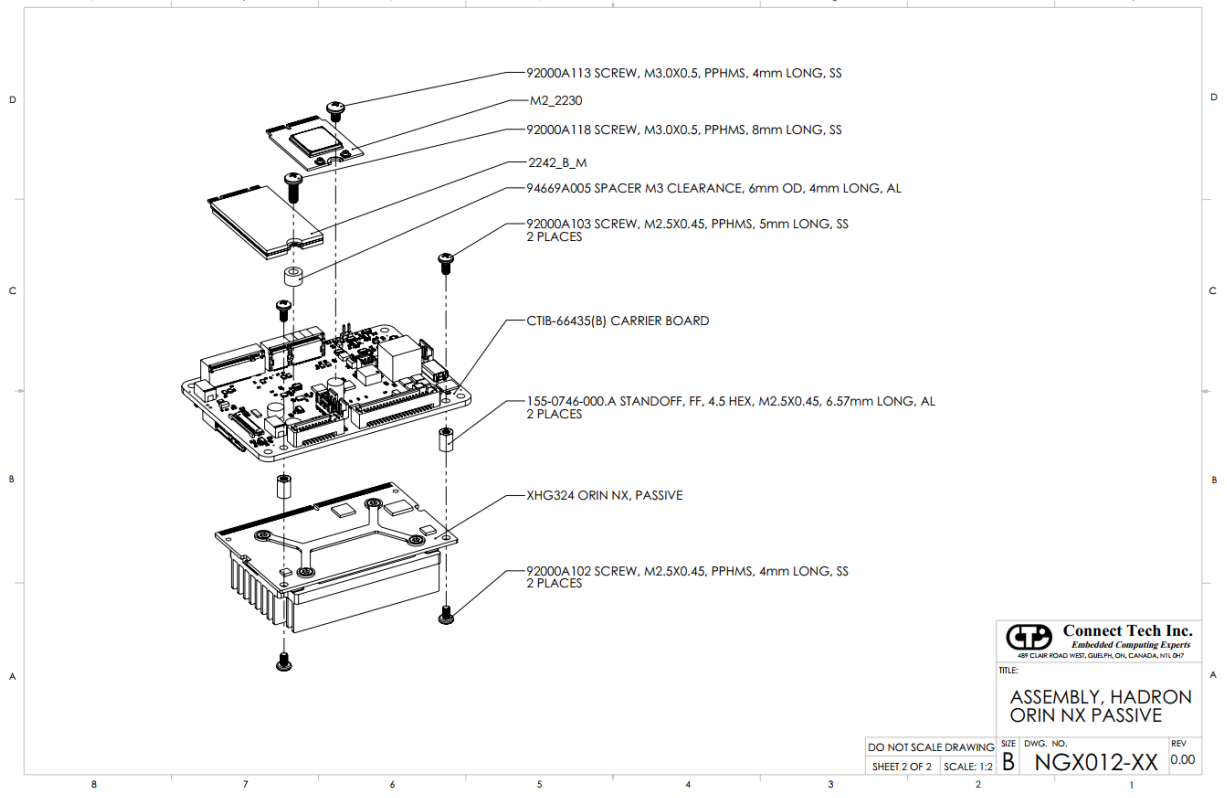
## NGX012-XX – Hadron TTP Integration Details (w/ Wi-Fi + 2242 NVMe)



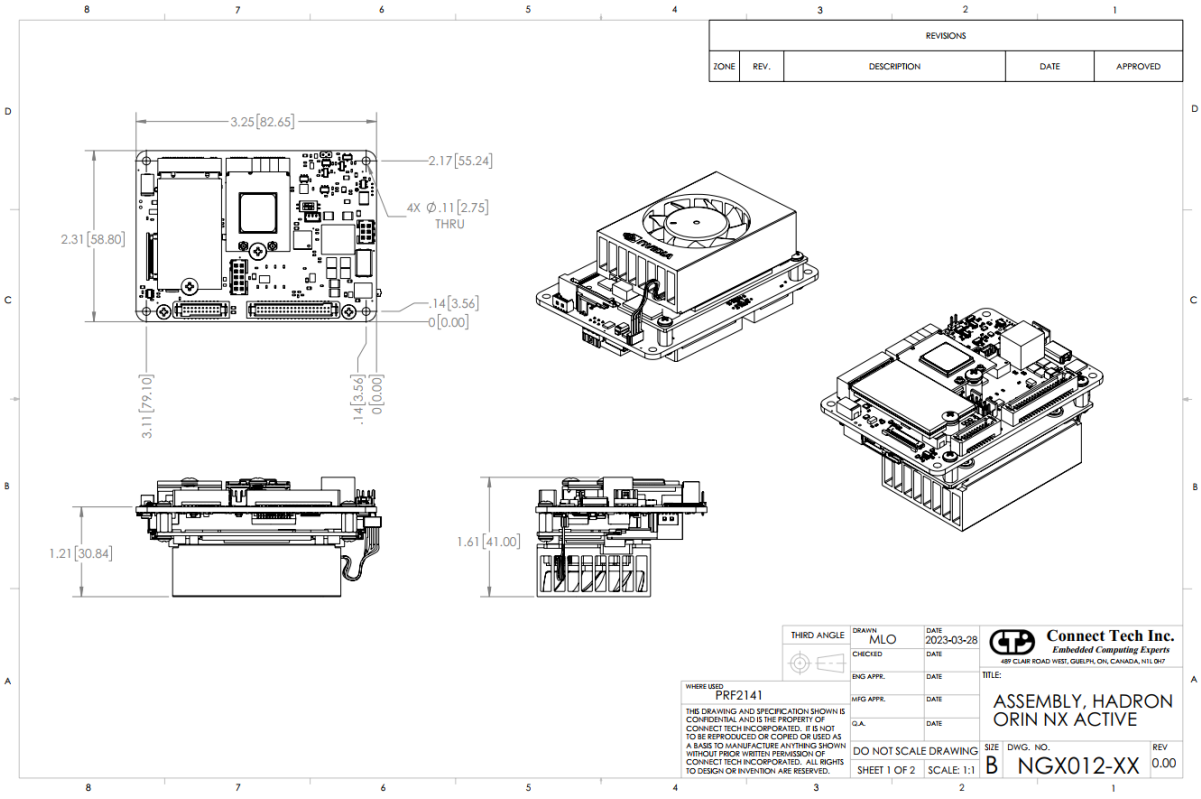



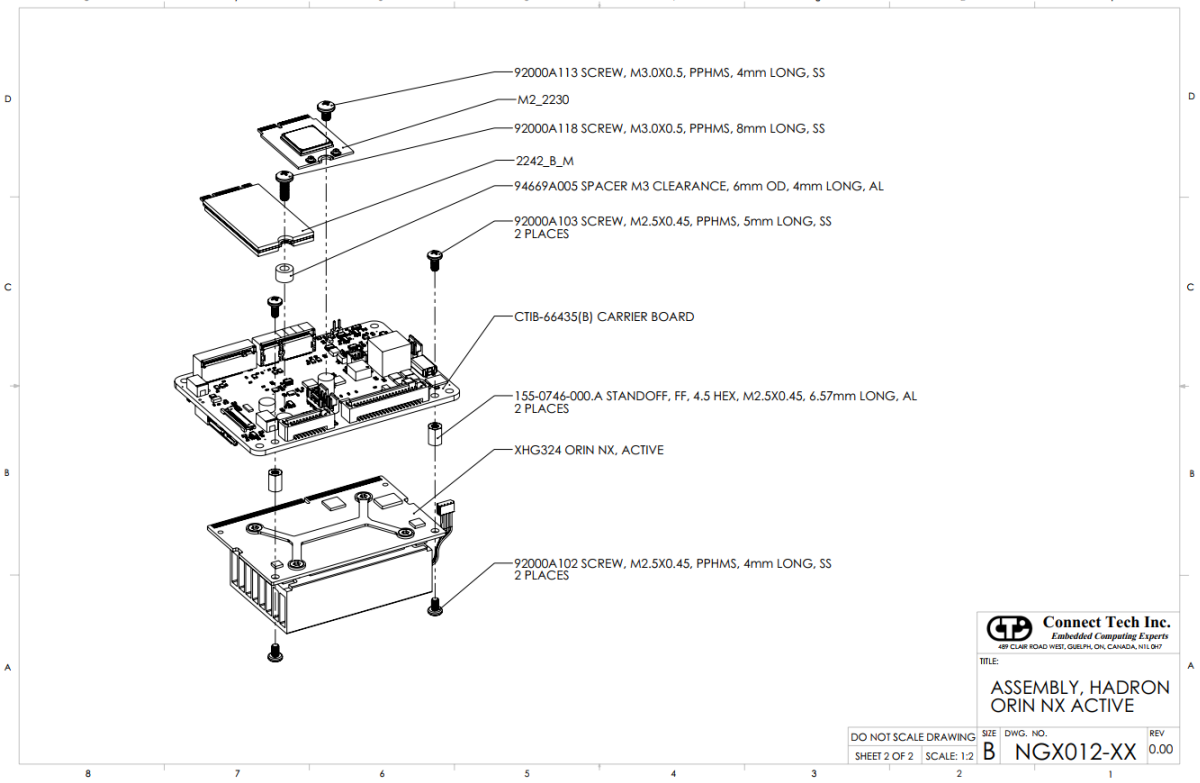
## NGX012-XX – Hadron Passive Thermal Integration Details (w/ Wi-Fi + 2242 NVMe)



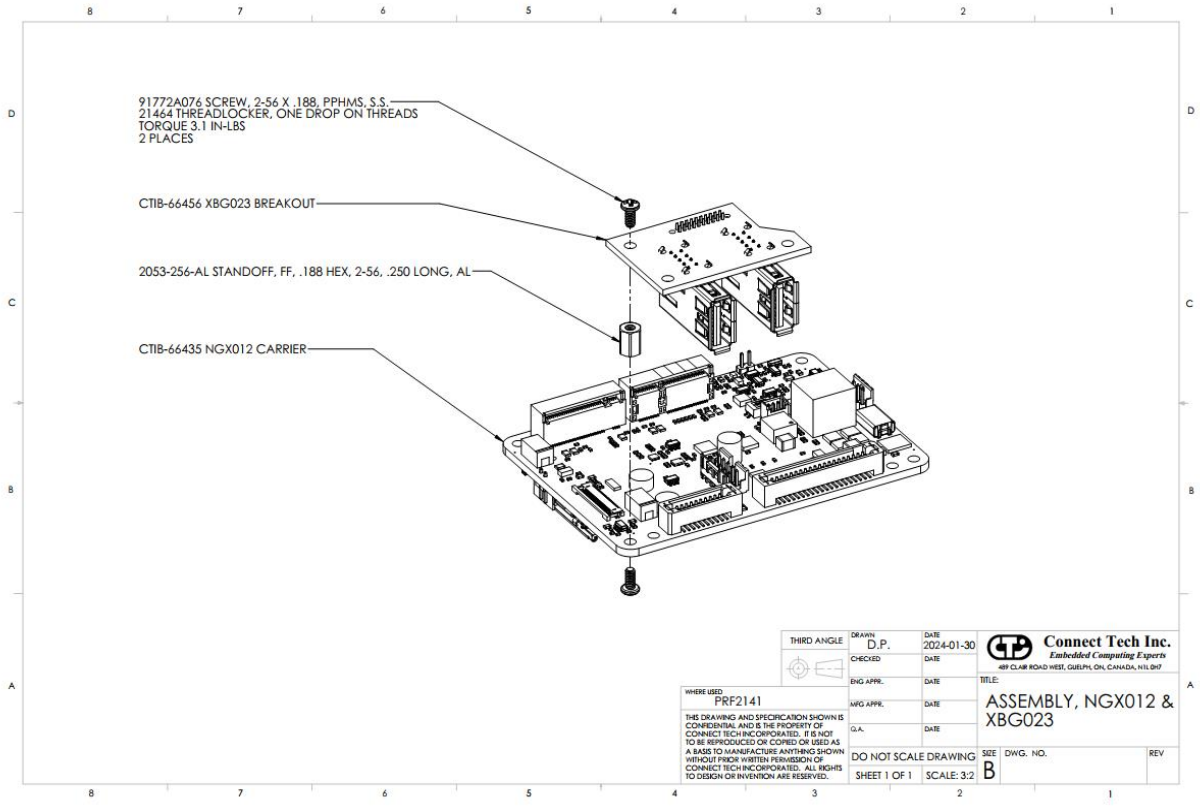



## NGX012-XX – Hadron Passive Thermal Integration Details (w/ Wi-Fi + 2242 NVMe)



## NGX012 and XBG023 Integration Drawing



# THERMAL DETAILS

**The Hadron Carrier has an Operating Temperature Range of -25°C to +85°C.**

However, it is important to note that the NVIDIA® Jetson Orin™ NX/ NVIDIA® Jetson Xavier™ NX Module has its own properties separate to that of the Hadron Carrier. The Hadron is rated for Operating Temperature Range of -25°C to +85°C.

Customer responsibility requires proper implementation of a thermal solution that maintains the Hadron SoC and Thermal Transfer Plate (TTP) temperatures below the specified temperatures (shown in the tables below) under the maximum thermal load and system conditions for their use case.

**NVIDIA® Jetson Orin™ NX**

| Parameter | Value | Units |
|---|---|---|
| Maximum Orin™ NX SoC Operating Temperature | T.cpu = 99 | °C |
| | T.gpu = 99 | °C |
| Orin™ NX SoC Shutdown Temperature | T.cpu = 105 | °C |
| | T.gpu = 105 | °C |

**NVIDIA® Jetson Xavier™ NX**

| Parameter | Value | Units |
|---|---|---|
| Maximum Xavier™ SoC Operating Temperature | T.cpu = 90.5 | °C |
| | T.gpu = 91.5 | °C |
| Xavier™ SoC Shutdown Temperature | T.cpu = 96.0 | °C |
| | T.gpu = 95.5 | °C |

# CABLE INFORMATION

| Drawing No. | Part No. | Function | Description |
|---|---|---|---|
| CTIC-00431 | CBG112 | Power Cable | 6-pin MiniTek w/ Latch, unterminated |
| CTIC-00433 | CBG117 | Ethernet Cable | 10-pin MiniTek w/ Latch, RJ-45 Panel Mount |
| CTIC-00477 | CBG136 | RTC Battery Cable | Molex 3 Position 1.25mm PicoBlade Connector |
| N/A | CBG615 | USB2.0 Cable | 20-pin Tiger-Eye to 2x USB 2.0 Type-A Female |
| N/A | CBG629 | I/O cable | 40-pin Tiger-Eye to Unterminated Flying Leads |
| N/A | CBG686 | USB3.0 Cable | 20-pin Tiger-Eye to 2x USB 3.0 Type-A Female (200mm) |
| N/A | XBG023 | USB 3.0 Breakout Board | 20-pin Tiger-Eye to 2x USB 3.0 Type-A Female |

## Cable Components:

Below is the list of components required to assemble USB and I/O cable for Hadron carrier:

| Component | USB Cable | I/O Cable |
|---|---|---|
| Connector Housing | ISDF-10-D-M | ISDF-20-D-M |
| Crimp Contact | CC03M-2830-GF | CC03M-2830-GF |
| Crimp Hand tool | CAT-HT-203-2830-12 | CAT-HT-203-2830-12 |
| Wire Gauge | 28 – 30 AWG | 28 – 30 AWG |
| Notes | USB Differential pairs needs to be twisted pairs | 3.3V and 5V output is limited to 500mA each. |

# CONNECT TECH CUSTOM THERMAL SOLUTIONS

Connect Tech Inc. has three custom solutions available for customer implementation, namely, an Active Cooling Solution, Passive Cooling Solution, and Thermal Transfer Plate Solution. Please note the different part numbers for NVIDIA® Jetson Orin™ NX / Orin Nano and NVIDIA® Jetson Xavier™ NX thermal solutions.

**Connect Tech Inc. NVIDIA® Jetson Orin™ NX / Orin Nano Thermal Solutions**

| Function | Part Number |
|---|---|
| **Orin NX / Orin Nano - Active Heatsink** | XHG325 |
| **Orin NX / Orin Nano - Passive Heatsink** | XHG324 |
| **Orin NX / Orin Nano - Thermal Transfer Plate** | XHG323 |
| **Xavier NX - Active Heatsink** | XHG312 |
| **Xavier NX - Passive Heatsink** | XHG311 |
| **Xavier NX - Thermal Transfer Plate** | XHG313 |

# CURRENT CONSUMPTION DETAILS

**NVIDIA® Jetson Orin™ NX**

| Parameter | Value | Units | Temperature |
|---|---|---|---|
| NVIDIA® Jetson Orin™ NX Module, Passive Cooling, Idle, Ethernet, Mouse and Keyboard plugged in | 7.5 | W | 25°C (typ.) |
| NVIDIA® Jetson Orin™ NX Module 8GB, Active Cooling, MAXN mode (5 cores full load, 1 core for CPU stress utility), CPU-stressed, GPU-stressed, Ethernet, Mouse and Keyboard plugged in | 29.1 | W | 25°C (typ.) |
| NVIDIA® Jetson Orin™ NX Module 16GB, Active Cooling, MAXN mode (7 cores full load, 1 core for CPU stress utility), CPU-stressed, GPU-stressed, Ethernet, Mouse and Keyboard plugged in | 32.3 | W | 25°C (typ.) |

**NVIDIA® Jetson Xavier™ NX**

| Parameter | Value | Units | Temperature |
|---|---|---|---|
| NVIDIA® Jetson Xavier™ NX Module, Passive Cooling, Idle, Ethernet, Mouse and Keyboard plugged in | 10 | W | 25°C (typ.) |
| NVIDIA® Jetson Xavier™ NX Module, Active Cooling, 20W - 6 core mode, CPU-stressed, GPU-stressed, Ethernet, Mouse and Keyboard plugged in | 27 | W | 25°C (typ.) |

# SOFTWARE / BSP DETAILS

All Connect Tech NVIDIA® Jetson based products are built upon a modified Linux for Tegra (L4T) Device Tree that is specific to each CTI product.

WARNING: The hardware configurations of CTI's products differ from that of the NVIDIA® supplied evaluation kit. Please review the product documentation and install ONLY the appropriate CTI L4T BSPs. Failure to follow this process could result in non-functional hardware.