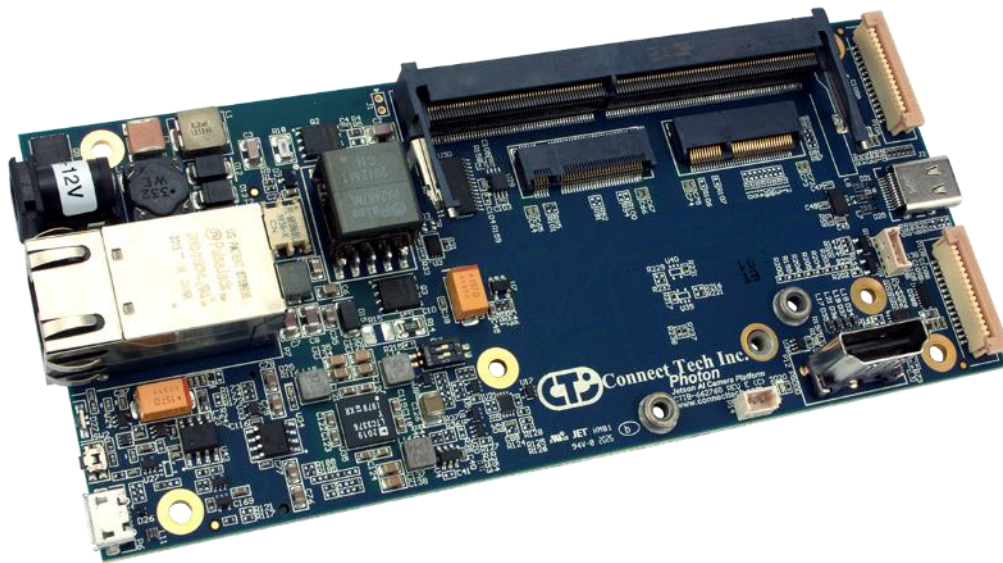




Connect Tech Inc.
Embedded Computing Experts

USERS GUIDE



Photon AI Camera Platform

CTIM-00080 Revision 0.06 2021-08-20



CONNECT TECH

www.connecttech.com

support@connecttech.com

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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. Technical Support 489 Clair Road West Guelph, Ontario Canada N1L 0H7 |
| Contact Information | sales@connecttech.com support@connecttech.com www.connecttech.com Toll Free: 800-426-8979 (North America only) Telephone: +1-519-836-1291 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. 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.

The Connect Tech Inc. Limited Warranty is only valid over the serviceable life of the product. This is defined as the period during which all components are available. Should the product prove to be irreparable, Connect Tech Inc. reserves the right to substitute an equivalent product if available or to retract the Warranty if no replacement is available.

The above warranty is the only warranty authorized by Connect Tech Inc. Under no circumstances will Connect Tech Inc. be liable in any way for any damages, including any lost profits, lost savings or other incidental or consequential damages arising out of the use of, or inability to use, such product.

Copyright Notice

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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 | 2020-01-16 | Preliminary Release |
| 0.01 | 2020-11-11 | Updated Board Pictures, Updated Features |
| 0.02 | 2020-11-13 | Updated WiFi/BT Feature Module Information |
| 0.03 | 2020-12-04 | Updated WiFi/BT Feature Module Information, Updated Current Consumption Details |
| 0.04 | 2021-02-22 | Added input voltage tolerance |
| 0.05 | 2021-08-05 | Revision F Feature changes |
| 0.06 | 2021-08-20 | Manual corrections and additional information |

INTRODUCTION

Product Features and Specifications

| Specifications | |
|--|--|
| Module Compatibility | NVIDIA® Jetson Nano™ (PRODUCTION MODULE ONLY) NVIDIA® Jetson Xavier™ NX (PRODUCTION MODULE ONLY) NVIDIA® Jetson TX2™ NX |
| Mechanical Dimensions | 145mm x 64.5mm |
| USB Camera | 1x USB 3.0 (Connector: USB Type-C) |
| MIPI Cameras | 2x 2-lane MIPI CSI-2 Connector: 1-1734248-5 15-pin FPC 1mm Pitch Connector Please refer to our Jetson Supported Cameras Page for more information |
| Camera Misc Interface | 1x I2C (Can be used for Lens Control) 4x GPIO (Can be used for Additional Camera Control) 1x Power Output (Can be used for IR LEDs) |
| Internal Debug Ports | 1x HDMI Display Output |
| Storage | 1x microSD Card Slot 1x NVMe Slot (M.2 2280 M-KEY PCIe Based) |
| Wireless Expansion | 1x WiFi Module (M.2 2230 E-KEY) 1x LTE Module (M.2 3042 B-KEY) w/ SIM Card Slot |
| Rear IO – Ethernet Please refer to this section for installation instructions for PoE PD | 1x 10/100/1000BASE-T Uplink PoE IEEE 802.3af-2003 (15.4W) Powered Device (PD) PoE+ IEEE 802.3at-2009 (25.5W) Powered Device (PD) Capable of operating on either network Low Cost PoE Bypass Option Available (NGX003) |
| Rear IO – USB OTG | 1x USB 2.0 OTG for Flashing Capability (Micro USB) |
| Rear IO – USB UART | 1x USB FTDI UART (Micro USB) |
| Rear IO – Power Input | 1x 2.1mm DC Barrel Jack (+12V DC +/-5%) |
| Rear IO – User Feedback | 1x RGB LED |
| Rear IO - Button | Dual RESET + FLASH Enable Functionality |
| Operating Temperature | -25°C to +85°C (-13°F to +185°F) |
| Weight | 76g (0.167lbs) |
| Warranty and Support | 1 Year Warranty and Free Support |

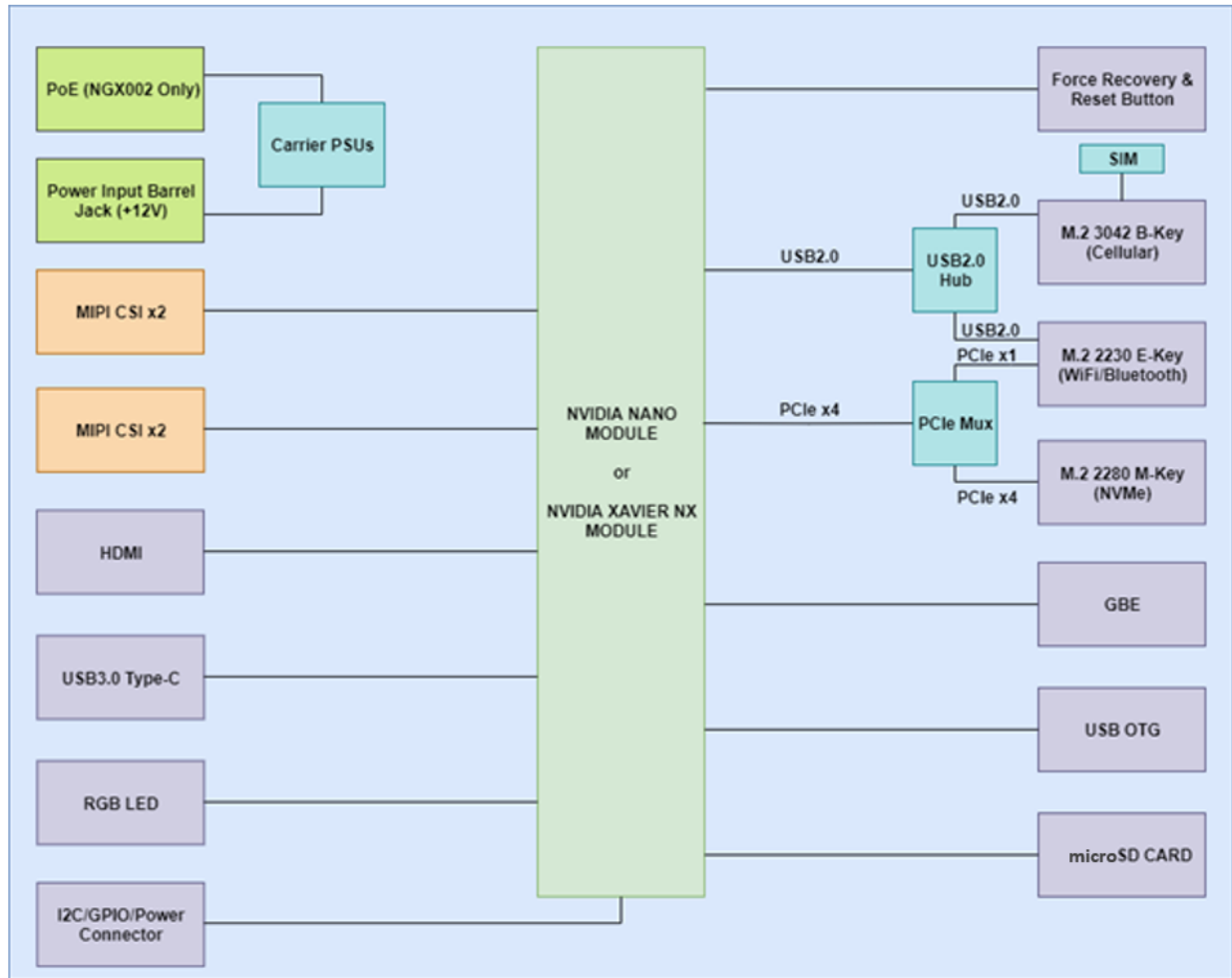
Connect Tech's Photon AI Camera Platform brings a low cost deployable Jetson solution to the market. Its design includes Power over Ethernet (PoE) 802.3at as well as a lower cost variant without it.

Part Numbers / Ordering Information

| Part Number | |
|-------------|--|
| NGX002 | Photon AI Camera Platform w/ PoE PD |
| NGX003 | Photon AI Camera Platform w/ No-PoE PD |

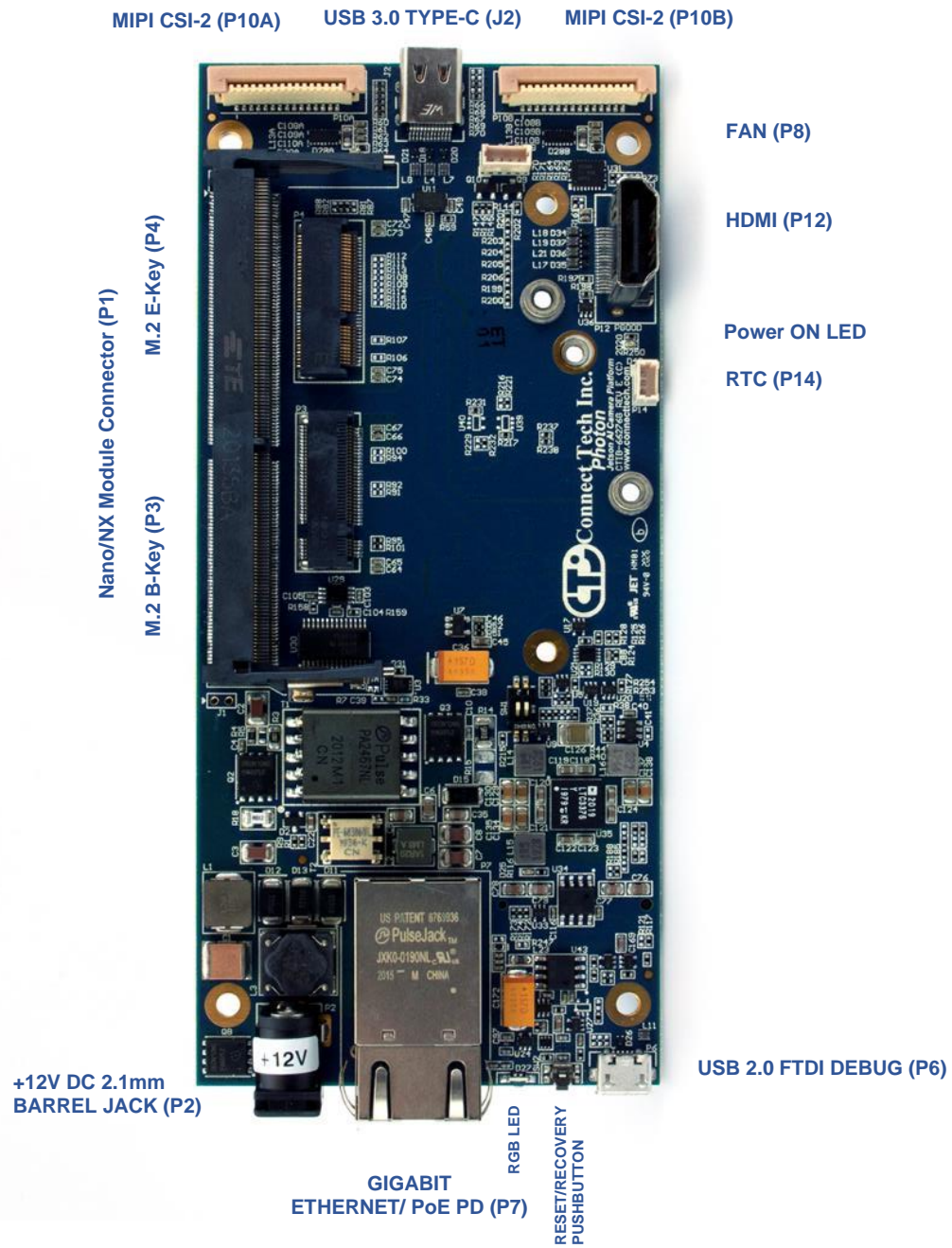
PRODUCT OVERVIEW

Block Diagram



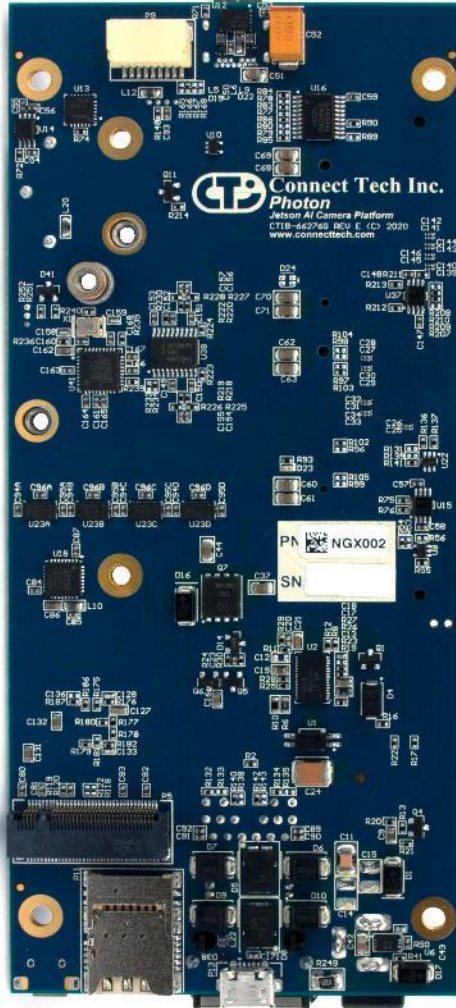
Connector Locations

TOP VIEW



BOTTOM VIEW

I2C/GPIO/POWER (P9)



M.2 M-Key (P5)

microSD CARD/SIM CARD (P11)

USB 2.0 OTG (P13)

Connector Summary

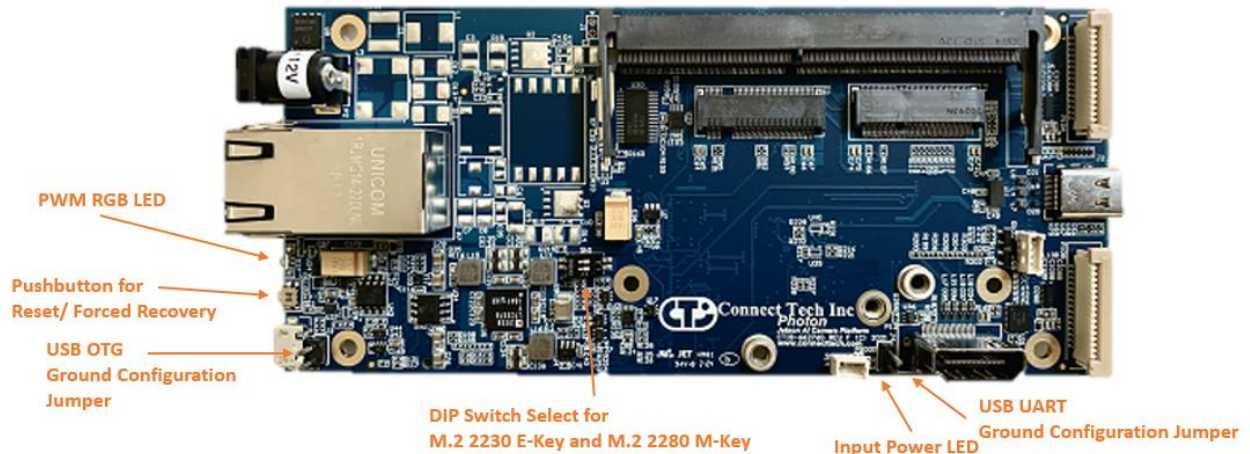
| Designator | Connector | Description |
|------------|---------------------|---|
| P1 | 2309413-1 | Module Board-To-Board Connector |
| P2 | PJ-002A | +12V DC 2.1mm Barrel Jack Connector |
| P3 | SM3ZS067U310ABR1200 | M.2 3042 B-Key 2G/3G/LTE Cellular Module Connector |
| P4 | 2199119-4 | M.2 2230 E-Key WiFi/Bluetooth Module Connector |
| P5 | SM3ZS067U410AMR1000 | M.2 2280 M-Key NVMe SSD Connector |
| P6 | 1981568-1 | USB 2.0 Micro-B FTDI Console Debug Connector |
| P7 | JXK0-0190NL | RJ-45 Gigabit Ethernet Connector |
| P8 | 53047-0410 | +5V 4-Position Molex 1.25mm PicoBlade Fan Connector |
| P9 | SM09B-NSHSS-TB | I2C/GPIO/LED JST Connector |
| P10A | 52610-1572 | MIPI CSI-2 Camera Connector |
| P10B | 52610-1572 | MIPI CSI-2 Camera Connector |
| P11 | 1042391430 | Dual microSD/SIM Connector |
| P12 | 0476591000 | HDMI Video Connector |
| P13 | 47589-0001 | USB 2.0 Micro-AB OTG Connector |
| P14 | 53047-0310 | RTC Battery Connector |

LED, Jumper & Switch Summary

The switches and jumpers should be set correctly before power up. Jumpers J3 and J4 should be considered when using Micro USB-B connectors P6 and P13 respectively with an external system.



WARNING: With the NGX002, if connecting and powering via Power Over Ethernet PD connection and connecting the USB2.0 FTDI debug console (P6), GPIO (P9), HDMI (P12), USB 2.0 OTG (P13) – please refer to this [section](#) to avoid damage to product and equipment



| Designator | Switch Description |
|------------|---|
| SW1 | DIP Switch Select for PCIe Lanes with M.2 2230 E-Key and M.2 2280 M-Key |
| SW2 | Pushbutton for dual function Reset/Recovery |

| Designator | LED Description |
|------------|-----------------------------|
| D25 | M.2 2280 M-Key Activity LED |
| D27 | PWM RGB LED |
| D40 | Input Power LED |

Note: D40 Power Input LED is only available on Revision E and above

| Designator | Switch Description |
|------------|--|
| J3** | P6 Micro-B USB UART Ground Configuration ON = System Frame GND and P6 Micro-B USB Shield Connected OFF = System Frame GND And P6 Micro-B USB Shield Disconnected |
| J4** | P13 Micro-B USB OTG Ground Configuration ON = System Frame GND and Digital Ground Connected OFF = 10Mohm resistance between System Frame GND and Digital GND |

**Note: J3 and J4 Shield GND Jumpers are only available on Revision F and above for NGX002 and NGX003. Also note that the configuration of J3:ON and J4:OFF will match the NGX002/NGX002 Revision A-E connectivity.

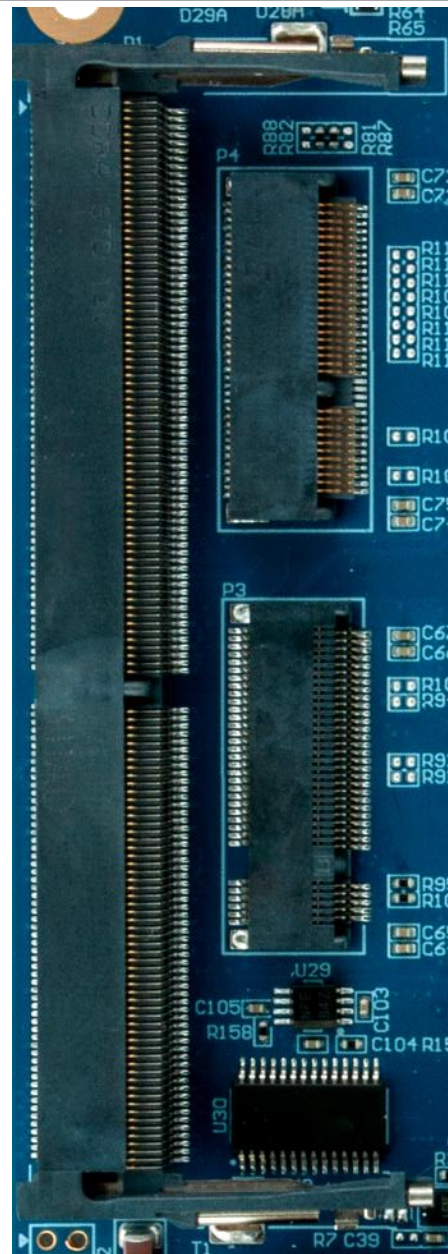
Note: Please refer to our Product Change Notice CTIU-00035(0.00) for more information on the Jumper Ground Configuration

DETAILED FEATURE DESCRIPTION

Jetson Module Connector

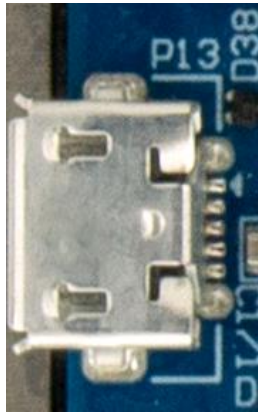
The NVIDIA Jetson NX modules connect to the Photon AI Camera Platform via a TE Connectivity DDR4 SODIMM 260 Pin connector.

| Function | Description |
|---------------------------------|--|
| Location | P1 |
| Type | TE Connectivity DDR4 SODIMM 260 Pin |
| Carrier Connector | Part Number: 2309413-1 Manufacturer: TE Connectivity |
| Mating Connector | Jetson NX Module |
| Pinout | Refer to NVIDIA System-On-Module datasheet for pinout details for a specific module https://developer.nvidia.com/embedded/downloads |
| Board-to-Module Standoff Height | M2.5 x 6.57mm standoffs required between NVIDIA Jetson NX Modules and Photon AI Camera Platform (CTI P/N: 155-0746-000.A) |



USB 2.0 OTG/Host Mode Connector

The Photon AI Camera Platform implements a USB2.0 Micro-AB connector to allow host mode access to the module or OTG flashing of the module. Please refer to the [Jumpers section](#) to ensure you are using the correct ground configuration for your setup. Please ensure DC power is used when connecting any externally powered device onto the system as mentioned in the following [section](#)


| Function | Description | |
|-------------------|--|---|
| Location | P13 |  |
| Type | Molex Micro-AB USB Connector | |
| Carrier Connector | Part Number: 0475890001 Manufacturer: Molex | |
| Mating Connector | USB 2.0 Micro-B or Micro-AB Cable | |
| Pinout | Refer to USB Standard | |

Note 1: A USB Micro-B cable is required for OTG Flashing.

Note 2: A USB Micro-A cable is required for Host Mode.

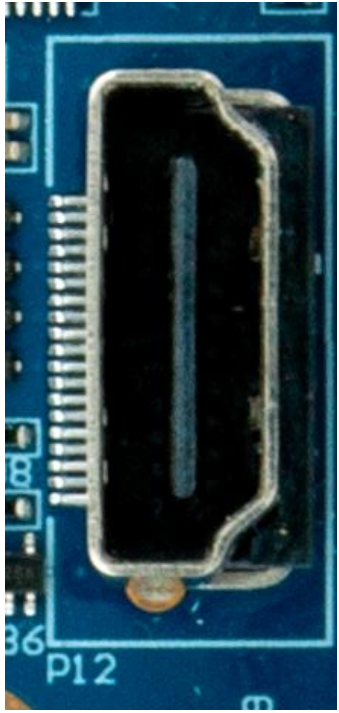
USB 2.0 FTDI Console Connector

The Photon AI Camera Platform implements a USB2.0 Micro-B connector to allow users console access to the module through an FTDI interface bridge (USB-Serial) to a desktop computer. Please refer to the [Jumpers section](#) to ensure you are using the correct ground configuration for your setup. Please ensure DC power is used when connecting any externally powered device onto the system as mentioned in the following [section](#)

| Function | Description | |
|-------------------|---|---|
| Location | P6 |  |
| Type | TE Connectivity Micro-B USB Connector | |
| Carrier Connector | Part Number: 1981568-1 Manufacturer: TE Connectivity | |
| Mating Connector | USB 2.0 Micro-B Cable | |
| Pinout | Refer to USB Standard | |

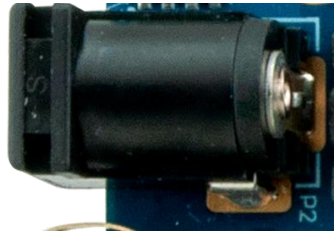
HDMI Connector

The NVIDIA Jetson NX modules will output video via the Photon AI Camera Platform vertical HDMI connector. Please ensure DC power is used when connecting any externally powered device onto the system as mentioned in the following [section](#)

| Function | Description | |
|-------------------|--|---|
| Location | P12 |  |
| Type | Molex HDMI Vertical Connector | |
| Carrier Connector | Part Number: 0476591000 Manufacturer: Molex | |
| Mating Connector | HDMI Cable | |
| Pinout | Refer to HDMI Standard | |
| | | |

12V Barrel Jack Connector

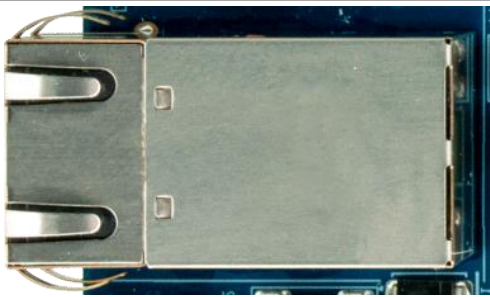
The Photon AI Camera Platform has a 2.1mm Barrel Jack connector for +12V, 2.1A power supplies. Please ensure the Photon AI Camera Platform is powered with a DC source when required as mentioned in the following [section](#)

| Function | Description | |
|-------------------|---|--|
| Location | P2 |  |
| Type | CUI PJ-002A Barrel Jack Connector | |
| Carrier Connector | Part Number: PJ-002A Manufacturer: CUI | |

GBE RJ45 Ethernet & PoE PD Connector

The NVIDIA Jetson NX modules will allow internet communication via the RJ-45 ethernet connector. GbE connector supports 10Mbps/ 100Mbps/ 1000Mbps.

The Photon AI Camera Platform can support Power over Ethernet delivery through this connector. As in all Power Over Ethernet implementations, the Photon AI Camera Platform includes power isolation transformers; therefore, it has an isolated ground from the power sourcing equipment. The Photon AI Camera Platform PoE PD version is typically used for remote installations where the only outside connectivity is the PoE PD connection itself.

| Function | Description |  |
|-------------------|---|--|
| Location | P7 | |
| Type | Pulse Electronics RJ-45 Ethernet Connector | |
| Carrier Connector | Part Number: JXK0-0190NL Manufacturer: Pulse Electronics | |
| Mating Connector | Ethernet (Cat5, Cat5e, Cat6, etc.) Cable | |
| Pinout | Refer to Ethernet Standard | |

Note 1: PoE PD 802.3af / 802.3at supported on PoE PD version of the Photon AI Camera platform (CTI PN: NGX002)

Note 2: PoE PD is **not** supported on lower cost non-PoE PD of the Photon AI Camera platform (CTI PN: NGX003)

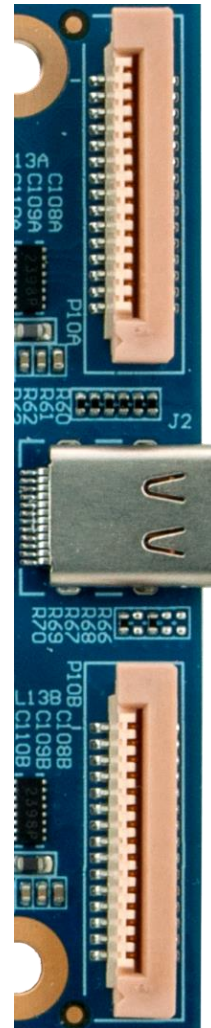


WARNING: If the Photon AI Camera Platform PoE PD version is powered over PoE in a lab setting or field service scenario, extreme care must be used when connecting externally powered equipment to P6 (USB), P9 (GPIO), P13 (USB) and P12 (HDMI) to avoid creating ground currents from differences in potential. Please refer to the following [section](#) for more information on connectivity.

MIPI CSI-2 Connectors

The NVIDIA Jetson NX modules will allow 2-Lane MIPI video input via the vertical FPC connectors. Please refer to our [Jetson Supported Cameras Page](#) for more information on our supported cameras.

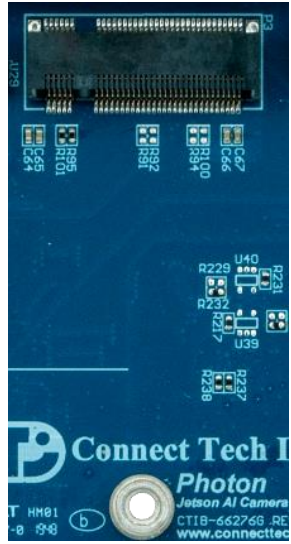
| Function | Description | |
|-------------------|--|-------------|
| Location | P10A, P10B | |
| MIPI Lane usage | P10A – CSI0 P10B – CSI2 | |
| Type | MOLEX FPC Vertical Connector 15 Pin | |
| Carrier Connector | Part Number: 0526101572 Manufacturer: MOLEX | |
| Pinout | Pin | Description |
| | 1 | GND |
| | 2 | CAM_DN0 |
| | 3 | CAM_DP0 |
| | 4 | GND |
| | 5 | CAM_DN1 |
| | 6 | CAM_DP1 |
| | 7 | GND |
| | 8 | CAM_CLKN |
| | 9 | CAM_CLKP |
| | 10 | GND |
| | 11 | CAM_PWDN |
| | 12 | CAM_MCLK |
| | 13 | I2C0_SCL |
| | 14 | I2C0_SDA |
| 15 | 3.3V | |



M.2 B-Key Connector

The Photon AI Camera Platform implements an M.2 3042 B-Key for a Cellular Module. Please ensure you certify the wireless cellular module on your home network before using it on that network.

| Function | Description |
|-------------------|--|
| Location | P3 |
| Type | JAE Electronics M.2 B-Key Connector |
| Carrier Connector | Part Number: SM3ZS067U310ABR1200 Manufacturer: JAE Electronics |
| Mating Connector | M.2 3042 Cellular Module |
| Pinout | Refer to M.2 NGFF Standard |




Note: Only a USB 2.0 based M.2 3042 B-Key Cellular module can be used with this connector. PCIe is not connected to the M.2 3042 B-Key.

M.2 E-Key Connector

The Photon AI Camera Platform implements an M.2 2230 E-Key for a PCIe x1, USB 2.0 WiFi/Bluetooth Module.

| Function | Description |
|-------------------|---|
| Location | P4 |
| Type | TE Connectivity M.2 E-Key Connector |
| Carrier Connector | Part Number: 2199119-4 Manufacturer: TE Connectivity |
| Mating Connector | M.2 2230 WiFi/Bluetooth Module |
| Pinout | Refer to M.2 NGFF Standard |

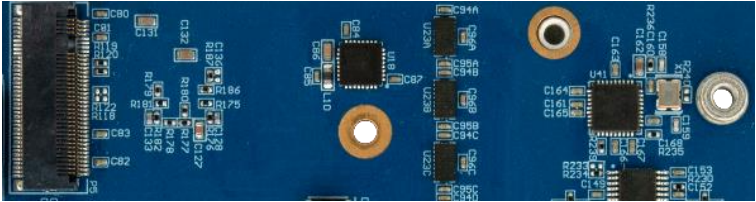


Note: Only a M.2 E-Key or M.2 M-Key can be operated at a time. This is a limitation in the amount of available PCIe lanes from the Jetson Module.

M.2 M-Key Connector

The Photon AI Camera Platform implements an M.2 2280 M-Key for a PCIe x4 Gen 2 NVMe. Only a M.2 2280 M-Key or M.2 2230 E-Key can be operated at a time. This is a limitation in the amount of available PCIe lanes from the Jetson NX module.

| Function | Description |
|-------------------|--|
| Location | P5 |
| Type | JAE Electronics M.2 M-Key Connector |
| Carrier Connector | Part Number: SM3ZS067U410AMR1000 Manufacturer: JAE Electronics |
| Mating Connector | M.2 2280 NVMe Module |
| Pinout | Refer to M.2 NGFF Standard |



Note 1: Compatibility with PCIe interface NVMe due to Jetson Module limitation

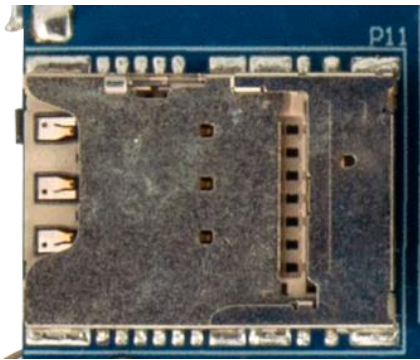
Note 2: PCIe Gen 2 maximum speed due to Jetson Module limitation

Note 3: Only PCIe based NVMe are compatible due to the hardware configuration. SATA based NVMe will not work.

Dual microSD Card/ Module SIM Card Connector

The Photon AI Camera Platform implements a Dual microSD Card/SIM Card connector. Please ensure the microSD card used with the system is compatible with speed class supported on the Jetson NX Module used.

| Function | Description |
|-------------------|---|
| Location | P11 |
| Type | Molex Dual microSD/SIM Card Connector |
| Carrier Connector | Part Number: 1042391430 Manufacturer: Molex |
| Mating Connector | microSD Card, SIM Card |
| Pinout | Refer to SD Card Standard and SIM Card Standard |

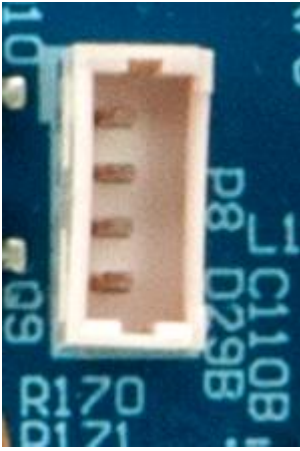


Note: microSD card is on the top, SIM card is on the bottom.

5V Fan Connector

The Photon AI Camera Platform implements a 4 Position Molex PicoBlade connector for active cooling capability.

| Function | | Description |
|-------------------|--|-------------|
| Location | P8 | |
| Type | Molex 4 Position 1.25mm PicoBlade Connector | |
| Carrier Connector | Part Number: 53047-0410 Manufacturer: Molex | |
| Mating Connector | Molex 0510210400 PicoBlade Connector | |
| Pinout | Pin | Description |
| | 1 | GND |
| | 2 | +5V |
| | 3 | FAN_TACH |
| | 4 | FAN_PWM |



RTC Battery Connector

The Photon AI Camera Platform implements a 3 Position Molex PicoBlade connector for an RTC Battery.

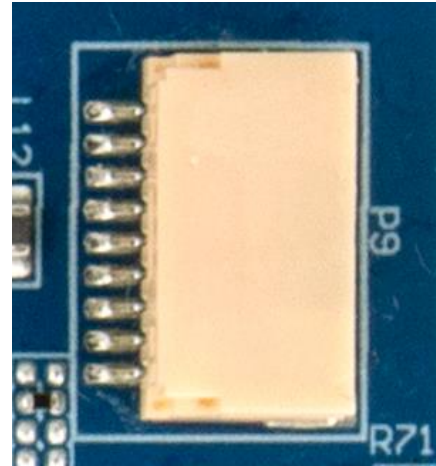
| Function | | Description |
|-------------------|--|-------------|
| Location | P14 | |
| Type | Molex 3 Position 1.25mm PicoBlade Connector | |
| Carrier Connector | Part Number: 53047-0310 Manufacturer: Molex | |
| Mating Connector | Part Number: 0510210300 Manufacturer: Molex | |
| Pinout | Pin | Description |
| | 1 | BAT+ |
| | 2 | NC |
| | 3 | BAT- |



I2C/GPIO/Power Connector

The Photon AI Camera Platform implements a JST SM09B Connector to allow for additional Power, GPIO, and I2C interfaces. Interface provides 3.3V capable i2C and GPIO. Please ensure DC power is used when connecting any externally powered device onto the system.


| Function | Description | |
|-------------------|--|-------------------|
| Location | P9 | |
| Type | JST 9 Position 1.0mm NSH Connector | |
| Carrier Connector | Part Number: SM09B-NSHSS-TB (LF)(SN) Manufacturer: JST | |
| Mating Connector | JST NSHR-09V-S NSH Connector | |
| Pinout | Pin | Description |
| | 1 | +3.3V |
| | 2 | GND |
| | 3 | CAM_GPIO0 / GPIO0 |
| | 4 | CAM_GPIO1 / GPIO1 |
| | 5 | CAM_GPIO2 / GPIO2 |
| | 6 | CAM_GPIO3 / GPIO3 |
| | 7 | Not Connected |
| | 8 | CAM_I2C_SCL |
| 9 | CAM_I2C_SDA | |



| | |
|-------|--|
| Notes | <p>I2C can appear under a different bus for different Jetson modules: Nano uses I2C bus i2c-9 Xavier-NX uses I2C bus i2c-11 TX2-NX uses I2C bus i2c-11 For more information on I2C usage, please click here.</p> <p>GPIO SYSFS for GPIO0, GPIO1, GPIO1, GPIO3 for different Jetson modules are respectively: Nano uses SYSFS 504, 505, 506, 507 Xavier-NX uses SYSFS 232,233,234,235 TX2-NX uses SYSFS 248,249,250,251 For more information on GPIO usage, please click here</p> |
|-------|--|

Reset & Recovery Pushbutton

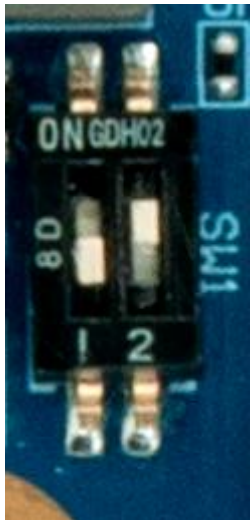
The Photon AI Camera Platform implements a dual functionality pushbutton for both Reset and Recovery of the platform. To Reset the module, simply press and hold the pushbutton for a minimum of 250 milliseconds. To put the Jetson module into Force Recovery mode, press and hold the pushbutton for a minimum of 10 seconds.

| Function | Description | |
|-----------------------|--|---|
| Location | SW2 |  |
| Type | Panasonic EVQP7 Pushbutton | |
| Carrier Connector | Part Number: EVQ-P7A01P Manufacturer: Panasonic | |
| Reset Button Press | Minimum 250ms (typ.) | |
| Recovery Button Press | Minimum 10s (typ.) | |

Note: A full power cycle of the Photon AI Camera Platform must be performed after module flashing.


M.2 M-Key / M.2 E-Key DIP Switch Selection

The Photon AI Camera Platform implements a 2 position DIP switch for the selection of the M.2 2280 M-Key (NVMe) or the M.2 2230 E-Key (WiFi/Bluetooth).

| Function | Description | |
|----------------------------|---|---|
| Location | SW1 |  |
| Type | TE Connectivity 1571983-1 DIP Switch | |
| Carrier Connector | Part Number: 1571983-1 Manufacturer: TE Connectivity | |
| SW1-1 – ON SW1-2 – ON | Not Used Enable PCIe for M.2 2280 M-Key (NVMe) | |
| SW1-1 – OFF SW1-2 – OFF | Not Used Enable PCIe for M.2 2230 E-Key (WiFi/Bluetooth) | |

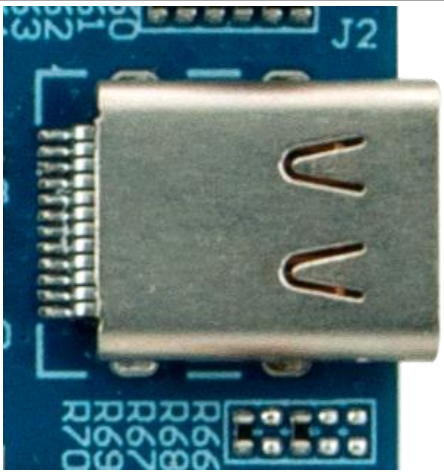
PWM RGB LED

The Photon AI Camera Platform implements a RGB LED that can be controlled by the user.

| Function | Description | |
|-------------------|---|---|
| Location | D27 |  |
| Type | RGB LED | |
| Carrier Connector | Part Number: LTST-S310F2KT Manufacturer: Lite-On | |

USB 3.0 Type-C Connector

The Photon AI Camera Platform allows for USB throughput and speed based on the limitations of the Jetson module used. The NVIDIA Jetson modules will allow camera input via the USB 3.0 Type-C connector.

| Function | Description | |
|-------------------|--|---|
| Location | J2 |  |
| Type | Wurth Electronics USB3.0 Type-C Connector | |
| Carrier Connector | Part Number: 632723300011 Manufacturer: Wurth Electronics | |
| Mating Connector | USB Type-C Cable | |
| Pinout | Refer to USB3.0 Type-C Pinout | |

Note 1: This port can be used for host mode access to the NVIDIA® Jetson Nano™ module at 5Gbps only.

Note 2: Display devices or devices requiring 20V power modes are not supported.

INSTALLATION

1. Ensure all external system power supplies are off and disconnected. Please refer to the [section](#) below on installation and advised cautions when using PoE PD
2. Install the NVIDIA Jetson NX Module into the DDR4 260 Pin SODIMM Connector (P1).
Be sure to follow the manufacturer's directions for proper installation of mounting hardware, thermal solution, and any other applicable requirements from the manufacturer.
3. The switches and jumpers should be set correctly before power up. Please refer to the [LEDs, Jumpers, and Switch summary](#) on more information on configuration.
4. Install the necessary cables for your application. At a minimum these would include:
 - a) Power cable to the input power connector or ethernet cable into its port
 - b) HDMI video display cable or Micro-B cable into the Console USB Port
 - c) Keyboard and Mouse via USB (a hub may be required for multiple devices)
 - d) MIPI Camera(s) or USB3 Type-C Camera (if applicable)
 - e) M.2 2280 M-Key or M.2 2230 E-Key Module (if applicable)
 - f) M.2 3042 B-Key Module (if applicable)
5. Connect the Power Cable of the +12V Power Supply into the Barrel Jack or Power Over Ethernet capable switch to the Ethernet Port (NGX002 Only).
6. Plug the AC cable on the +12V Power Supply into the wall socket (this does not apply to Power Over Ethernet). DO NOT power up your system by plugging in live power.

POE PD CONNECTIVITY

It is highly recommended to use a DC power source with the Photon AI Camera Platform PoE PD version when connecting any device that is externally powered. Care must be taken when plugging into these connectors

- [USB 2.0 FTDI Console \(P6\)](#) Powering via PoE should be avoided while directly connecting an external host system (i.e. laptop or workstation) to P6 using a micro-B USB cable
- [GPIO \(P9\)](#) Powering via PoE should be avoided while directly connecting to another circuit board powered by external power source
- [HDMI \(P12\)](#) Powering via PoE should be avoided while directly connecting an AC powered HDMI monitor to P12 using a HDMI cable
- [USB 2.0 OTG Host Mode \(P13\)](#) Powering via PoE should be avoided while directly connecting an external host system (i.e. laptop or workstation) to P13 using a micro-B USB cable

In the case of a remote field service scenario, a USB isolator cable must be used with the USB cable when connecting to the micro-B USB connectors (P6 and P13) due to the floating grounds. In addition, when using the HDMI connector (P12), the Photon Jetson AI Camera Platform can be sitting at different potential than the monitor causing ground currents. It is suggested to avoid directly connecting to these peripherals without any additional isolation.

Please contact for support@connecttech.com for further information.

SOFTWARE SETUP

Prior to hardware installation, ensure the correct software installed on the Jetson Module.

Supported Software Board Support Packages can be found on our website:

<https://connecttech.com/resource-center/l4t-board-support-packages/>

Board Support Package Installation instructions can be found:

<http://connecttech.com/resource-center/kdb373/>

SDK Component Installation instructions can be found:

<http://connecttech.com/resource-center/kdb374/>

For all other Jetson documentation, please check out our Resource Center:

<https://connecttech.com/resource-center-category/all-kdb-entries/>

If you would like to switch between Photon Board Support Package configurations without reflashing your system, run the following command as a root user when using a Xavier-NX module:

```
sudo cti-nx-fdt.sh
```

or when using a Nano module:

```
sudo cti-nano-fdt.sh
```

OPTIONAL INTEGRATION FEATURES

| Feature | Module Size | Connector | Manufacturer |
|-----------------|-------------|-----------|--------------|
| Cellular Module | M.2 3042 | P3 | Quectel |
| WiFi / BT | M.2 2230 | P4 | Intel |
| NVMe | M.2 2280 | P5 | Samsung |

POWER CONSUMPTION & THERMALS

Thermal Details

The Photon AI Camera Platform has an operating temperature range of -25°C to +85°C. However, it is important to note that the NVIDIA® Jetson Modules have their own properties separate to that of the Photon AI Camera Board. The NVIDIA® Jetson modules match the Photon operating temperature range of -25°C to +85°C (-13°F to +185°F).

Customer responsibility requires proper implementation of a thermal solution that maintains the NVIDIA® Jetson modules 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 Nano™

| Parameter | Value | Units |
|--|--------------|-------|
| Maximum Tegra X1 Operating Temperature | T.cpu = 97 | °C |
| | T.gpu = 97.5 | °C |
| Tegra X1 Shutdown Temperature | T.cpu = 103 | °C |
| | T.gpu = 104 | °C |

NVIDIA® Jetson Xavier™ NX

| Parameter | Value | Units |
|--|--------------|-------|
| Maximum Xavier SoC Operating Temperature | T.cpu = 90.5 | °C |
| | T.gpu = 91.5 | °C |
| | T.aux = 90.0 | °C |
| Xavier SoC Shutdown Temperature | T.cpu = 96.0 | °C |
| | T.gpu = 97.0 | °C |
| | T.aux = 95.5 | °C |

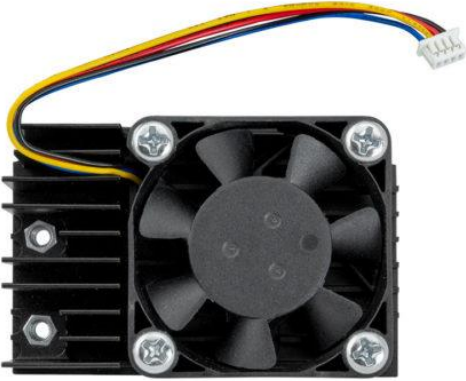


NVIDIA® Jetson TX2™ NX

| Parameter | Value | Units |
|--|--------------|-------|
| Maximum Tegra X2 Operating Temperature | T.cpu = 95.5 | °C |
| | T.gpu = 95.5 | °C |
| Tegra X2 Shutdown Temperature | T.cpu = 101 | °C |
| | T.gpu = 101 | °C |

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 contact Connect Tech Inc. for more information regarding these options.

Connect Tech Inc. NVIDIA® Jetson Nano™ Thermal Solutions

| Function | Part Number | |
|--------------------------------|-------------|--|
| Active Cooling | XHG309 |  |
| Passive Cooling | XHG308 |  |
| Thermal Transfer Plate Cooling | XHG310 |  |

Connect Tech Inc. NVIDIA® Jetson Xavier NX™ Thermal Solutions

| Function | Part Number | |
|--|-------------|--|
| Active Cooling Cools SoC and Memory | XHG312 |  |
| Active Cooling Cools SoC Only Note: Needs additional fan extension cable | XHG314 |  |
| Passive Cooling | XHG311 |  |
| Thermal Transfer Plate Cooling | XHG313 |  |

CURRENT CONSUMPTION DETAILS

| Parameter | Value | Units | Temperature |
|--|-------|-------|-------------|
| NVIDIA® Jetson™ Nano Module, Passive Cooling, Idle, HDMI, Ethernet, Mouse and Keyboard plugged in | 3.5 | W | 25°C (typ.) |
| NVIDIA® Jetson™ Nano Module, Passive Cooling, MAXN mode, CPU stressed, GPU stressed, HDMI, Ethernet, Mouse and Keyboard plugged in | 13.5 | W | 25°C (typ.) |

| Parameter | Value | Units | Temperature |
|---|-------|-------|-------------|
| NVIDIA® Jetson™ Xavier NX Module, Passive Cooling, Idle, HDMI, Ethernet, Mouse and Keyboard plugged in | 7.5 | W | 25°C (typ.) |
| NVIDIA® Jetson™ Xavier NX Module, Passive Cooling, 15W - 6 core mode, CPU stressed, GPU stressed, HDMI, Ethernet, Mouse and Keyboard plugged in | 29 | W | 25°C (typ.) |