Connect Tech Inc.

Embedded Computing Experts

USERS GUIDE

Forge Carrier for NVIDIA® Jetson AGX Orin™

CTIM-00081 Revision 0.08 2024-10-22

NVIDIA ELITE PARTNER

CONNECT TECH

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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: http://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 Rd. W. 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 1-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.

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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	2022-09-09	Preliminary Release
0.01	2023-02-10	Updated Thermal Details
0.02	2023-02-10	Updated Thermal Details with Drawings
0.03	2023-02-19	Updated ordering information
0.04	2023-03-06	Updated thermals, weight, various typos
0.05	2023-08-31	Updated RS485 pinout
0.06	2023-09-15	Updated GPIO connector information.
0.07	2023-10-17	Updated GPIO pinout information.
0.08	2024-10-22	Updated M.2 M-Key 2280 expansion slot pinout information

INTRODUCTION

Forge is a full featured carrier board specifically designed for commercially deployable platforms. Forge provides access to the impressive array of latest generation interfaces available on the NVIDIA® Jetson AGX Orin™ including dual 10GBASE-T Ethernet. The Forge also includes 2x USB 3.2, 2x GbE, Display Port, 2x NVMe storage slots, 1x WiFi/BT expansion and a cell modem expansion slot. As well as several GPIO/SPI/I2C/UART/RS232-485 interface and a locking 6pin Mini-Fit Jr. Power input Connector.

Product Features and Specifications

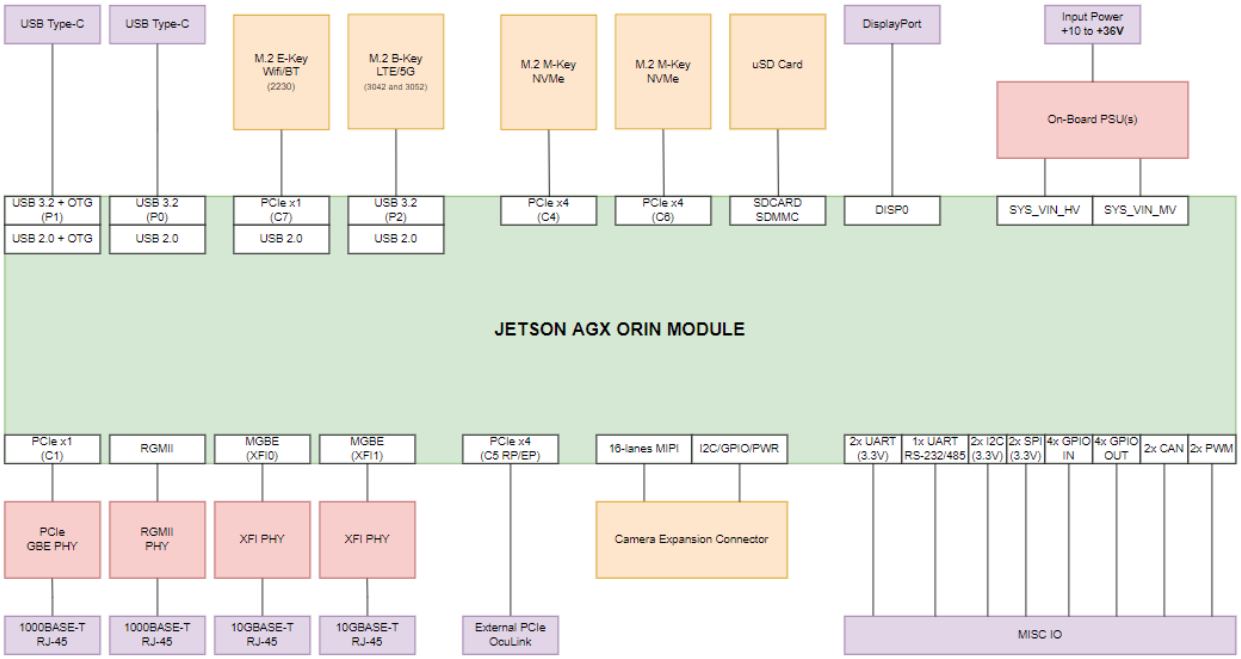
Specifications	
Compatibility	NVIDIA® Jetson AGX Orin™ 32GB & 64GB
Networking	2x 10GBASE-T, 2x 1GBASE-T
Camera Inputs	1x 16-Lane MIPI Expansion Connector that interfaces directly to a range of MIPI CSI, GMSL2 or FPD-Link III image sensors.
Storage	2x 1x M.2 Key M 2280 NVMe 1x Micro SD Card
UARTs	2x @ 3.3V levels UART1 and UART2 1x RS-232/485 UART
Expansion Slots	1x M.2 Key E 2230 Wifi/BT (PCIe/USB2) 1x M.2 Key B 3042/3052 (LTE/5G - USB3) with Micro SIM (3FF)
Display	1x DisplayPort (DP++ capable using an HDMI adapter)
USB	1x USB 3.2 Port (Type-C) 1x USB 3.2 port OTG capable (Type-C)
External PCIe	1x OCuLink Connector (4 lane PCIe Gen4) – Root and Endpoint mode supported
I2C/SPI	2x I2C Channel @ 3.3V IO 2x SPI Channel @ 3.3V IO
GPIO Expansion Connector	4x 3.3V GPI Inputs 6x 3.3V GPO Outputs (2x PWM Capable) 1x 3.3V Power Pin at 1A
Input Power	10 – 36V DC Wide input Power connector (6pin Mini-fit Jr)
Operating temperature	Carrier Only: -40°C to +85°C
Dimensions	155 x 125mm

Part Numbers / Ordering Information

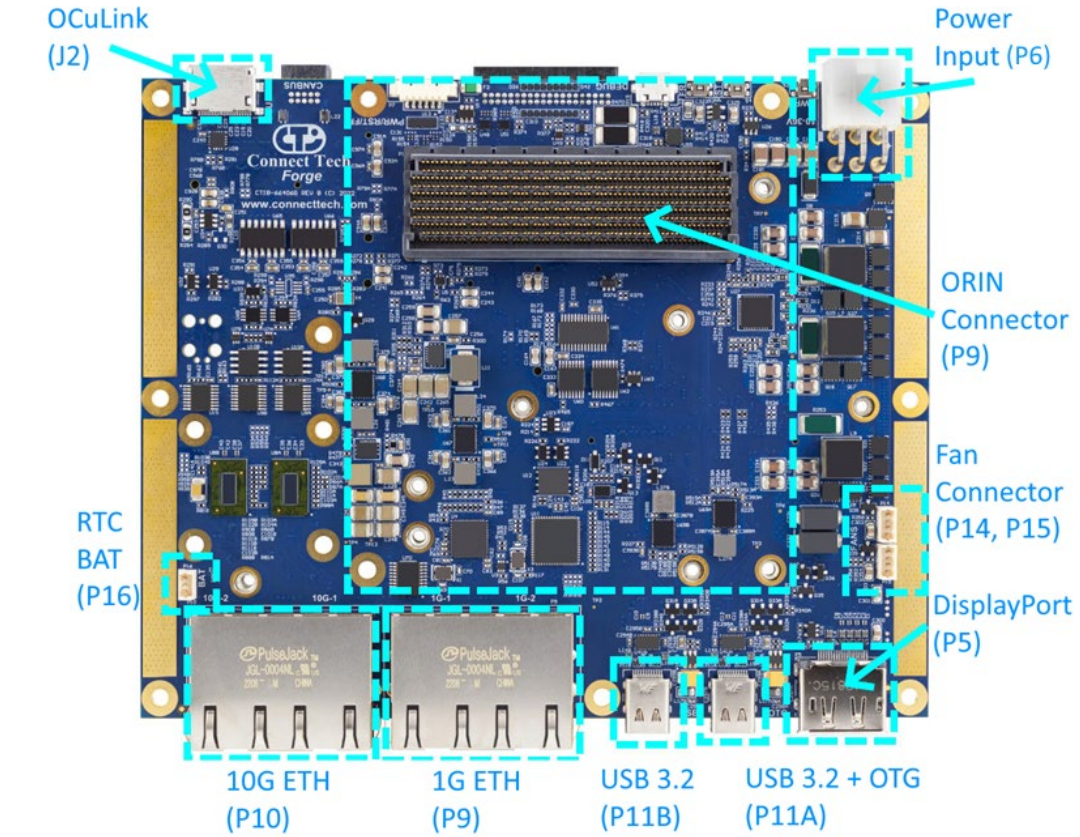
Part Number	
AGX201	Carrier Only
AGX201-xxx	Pre-Integrated Products ask sales@connecttech.com for options Integration options can include: - 32G/64G NVIDIA® Jetson AGX Orin™ Module - WiFi/BT Modules - NVMe Modules - 5G/LTE Modules - JCB / Camera Add-on Modules (GMSL, FPD-Link, MIPI)
MSG103	PSU 6pin 12V 250W (CTI provided power brick)
XHG319	NVIDIA® Jetson AGX Orin™ Advanced Active Thermal
XHG320	NVIDIA® Jetson AGX Orin™ Advanced Passive Thermal
XHG321	Forge Carrier 10G Passive Finned Heatsink (required for Forge if above heatsinks are purchased)

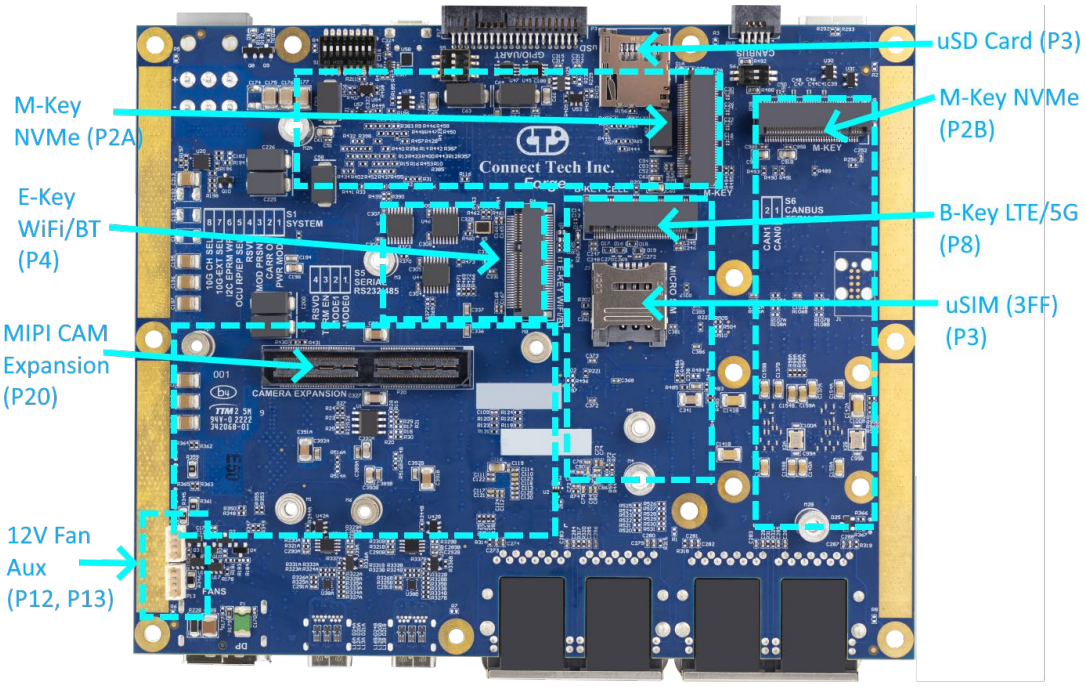
PRODUCT OVERVIEW

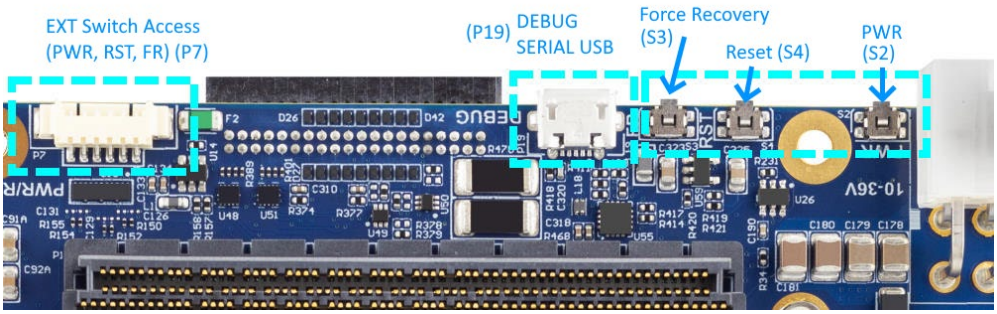
Block Diagram



Connector Summary & Locations

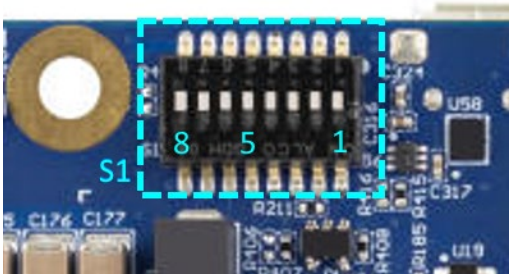
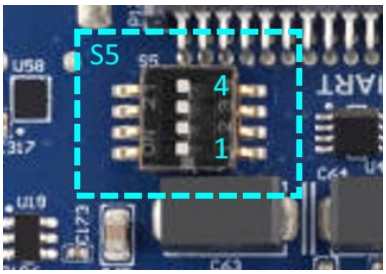


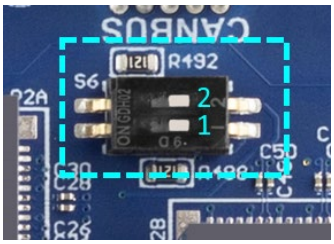




Designator	Description
P1	Jetson AGX Orin™ connector
P2A, P2B	M.2 M-Key (NVMe) connector
P6	Input Power Connector
P19	USB UART Debug Console connector
P11A	USB 3.1 device port and OTG programming port connector
P11B	USB 3.1 device port
P17	GPIO/SPI/I2C/UART/RS232-485
P18	CAN Bus Connector
P20	MIPI Camera Expansion connector
P4	M.2 E-Key connector (2230)
P8	M.2 B-Key connector (3042 and 3052)
P3	Micro SIM top loading connector (3FF)
P12, P14	12V Fan connector (includes TACH feedback – Rev D PCB and greater)
P13, P15	12V Fan connectors auxiliary (no TACH feedback – see primary connector)
P3	Micro SD Card slot (Push/Push)
P5	DisplayPort Connector (DP++ HDMI dongle compatible)
P9	Dual GbE RJ45 connector
P10	Dual 10G RJ45 connector
P16	RTC Battery connector
J2	OCuLink Connector (Rootport and Endpoint support)
P7	PWR, RST and Force Recovery external cable attach
S2	Power Button (used for manual power mode)
S3	Force Recovery Button (used to put module into flash mode)
S4	Reset Button (used to reset the system at any time)

Dip Switch Summary & Locations

Designator	Description
S1	*Power Selection and MFG settings Dip Switch* 1 – **POWER ON Mode Selection Auto ON = OFF, Manual = ON** 2 – *Used for Manufacturing test only* 3 – *Used for Manufacturing test only* 4 – *Reserved* 5 – **OCULINK Selection "Root Point" RP Mode = OFF, "End Point" EP Mode = ON** 6 – *Used for Manufacturing test only* 7 – *Used for Manufacturing test only* 8 – *Used for Manufacturing test only* 
S5	RS232/RS485 Serial Port Mode and Termination Selection: **1** – Mode0 **2** – Mode1 **3** – RS485 RX Termination Enable for Channel A **4** – RS485 RX Termination Enable for Channel B **MODE0 (1)** / **MODE1 (2)** / **Channel A** / **Channel B** OFF / OFF / OFF / OFF ON / ON / RS-232 / RS-232 ON / OFF / RS-232 / RS-485 OFF / ON / RS-485 / RS-485 

S6	CANBus Termination Enable” **1** – 120ohm Termination Enable Channel 0 **2** – 120ohm Termination Enable Channel 1 

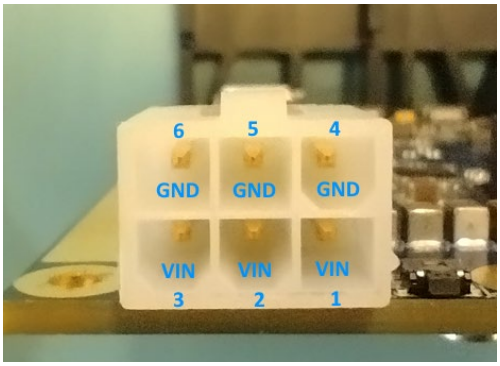
DETAILED FEATURE DESCRIPTION

Power Connector

Power Input: 10-36V input range

Connectors

Function	Forge Power Supply Connector
Location	P6
Type	Mini Fit Jr 2x3 Right Angled
Connector	Part Number: 39301060 Manufacturer: Molex
Mating Connector	Receptacle Housing 5557 series Cable Assembly 45135 series
Pinout	Pin 1-3 are Power Input (VIN) 10-36V Pin 4-6 are Ground (GND)

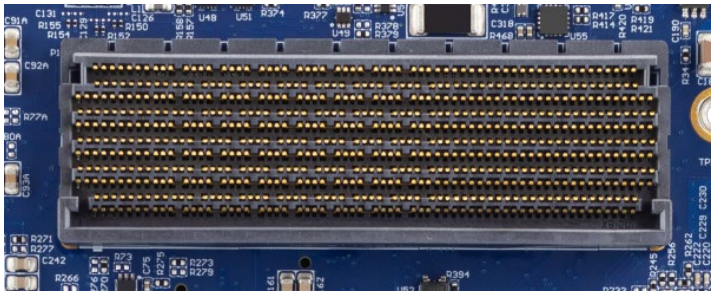


Jetson AGX Orin™ Board-to-Board Carrier Connector

With the NVIDIA® Jetson AGX Orin™, the processor and chipset are implemented on the module.

Connectors

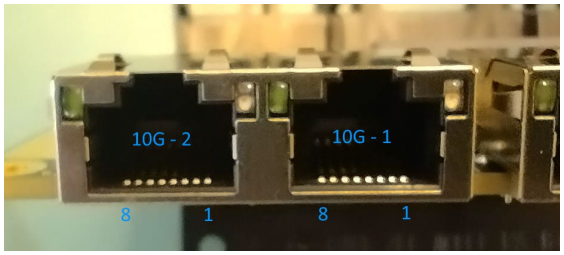
Function	NVIDIA® Jetson AGX Orin™ Module Interface
Location	P9
Type	Molex Mirror Mezz™ Connector
Connector	Part Number: 203456-0003 Manufacturer: Molex
Mating Connector	Same as above.
Pinout	Refer to NVIDIA® Jetson AGX Orin™ System-on-Module datasheet and OEM design guide for pinout details



10G Ethernet (2 Ports)

Two ports of RJ45 10G BASE-T Ethernet for high-speed networking.

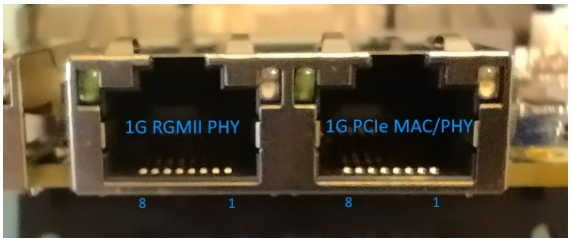
Connectors

Function	10 GBE Network Connectivity	
Location	P10	
Type	2x 8 pin RJ45 with integrated Magnetics	
Connector	Manufacturer: Pulse	
Mating Cable	Standard RJ45 CAT 6a	
Pinout	As per the IEEE-802.3 specification	
Notes	Both Channels use AQR113 PHYs Originating from MGBE0 and MGBE1 on the AGX Orin™ Module.	

1G Ethernet (2 Ports)

Two ports of RJ45 1G BASE-T Ethernet for networking.

Connectors

Function	GBE Network Connectivity	
Location	P9	
Type	2x 8 pin RJ45 with integrated Magnetics	
Connector	Manufacturer: Pulse	
Mating Cable	Standard RJ45 CAT 5e or better	
Pinout	As per the IEEE-802.3 specification	
Notes	1G RGMII PHY Sources from the AGX ORIN™ Module. The 1G PCIe MAC/PHY sources from a PCIe device (Intel i210 or equivalent).	

USB 3.2 (2 Ports)

Two ports of USB 3.2 Type-C interfaces with 3A at 5V output capable per port.

Connectors

Function	USB 3.2 General Purpose Ports	
Location	P11A, P11B	
Type	2x 26 pin Type C USB Connectors	
Connector	Part Number: 632723300011 Manufacturer: Wurth	
Mating Cable	Standard USB 3.0 Type C or better	
Pinout	As per the USB 3.2 specification	
Notes	One USB port is only a DFP (Downward facing port), the second is capable of both DFP and UFP (Upward Facing Port). The OTG port (P11A) is used for module Flashing access in recovery mode. Each USB port is capable of delivering up to 3A at 5V at USB 3.2 Gen 2 (10Gbps) speeds for both ports. Note that alternate modes for power or video are NOT supported on these USB interfaces. USB devices only.	

DISPLAYPORT Video Output

The Forge supports one DISPLAYPORT capable of 4k output resolution.

Connectors

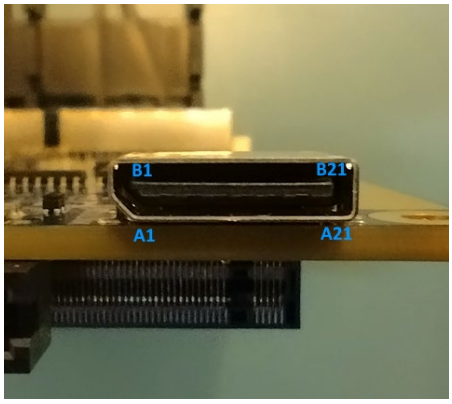
Function	Display Output	
Location	P5	
Type	Full size DisplayPort connector	
Connector	Part Number: Manufacturer:	
Mating Cable	Standard DISPLAYPORT or DISPLAYPORT to HDMI adapter cable	
Pinout	As per DISPLAYPORT	
Notes	The DISPLAYPORT output is capable of supporting HDMI using a DP++ compliant cable adapter.	

OCuLink (SFF-8611) External PCIe x4 Connector

The Forge supports one OCuLink connector for use as an external general purpose x4 PCIe Gen 4 connection to access external peripherals.

Connectors

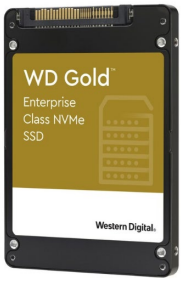
Function	External OCuLink PCIe Expansion
Location	J2
Type	OCuLink 42pin Receptacle
Connector	Part Number: 171982-0142 Manufacturer: Molex
Mating Cable	SFF-8611 mating cable end to various other end connector types
Pinout	As per PCIe OCuLink Specification v1.1. Supports up to x4 PCIe Gen 4



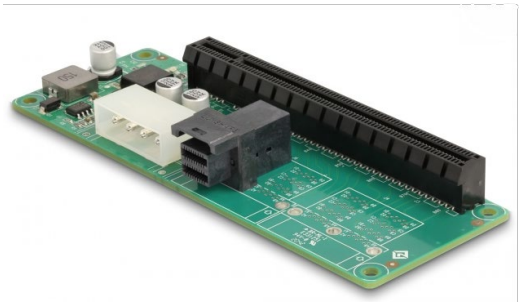
Notes

OCuLink (Root Port Mode) is used for expanding the PCIe bus allow for connection to external device peripherals.

OCuLink device examples:
SFF-8611 to U.2 high speed PCIe/high density SSD Drive adapter cable and SSD drive



SFF-8611 to SFF-8643 adapter cable with a PCIe edge card extention.

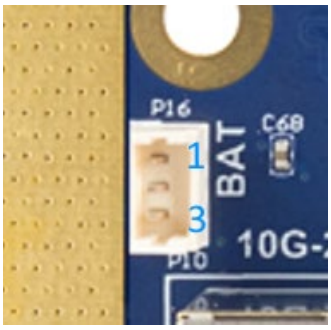


RTC Battery Connector

The Forge allows for an external 3V RTC battery to be connected. For further information about RTC battery selection and life time estimation, see Application Note 00009: https://connecttech.com/pdf/CTIN-00009.pdf.

Connectors

Function	RTC Battery Connector		
Location	P16		
Type	3 pin PicoBlade (vertical)		
Connector PN	53047-0310 - Manufacturer: Molex		
Mating PN	51021-0300 - Manufacturer: Molex		
Pinout	Pin	Signal	Description
	1	+3V	RTC Battery Voltage Input
	2	NC	No Connect
	3	GND	Ground/Return

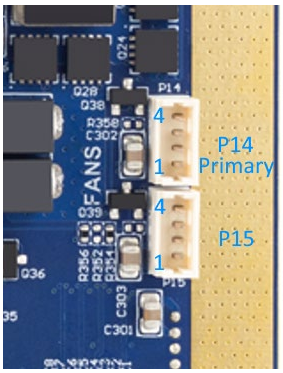


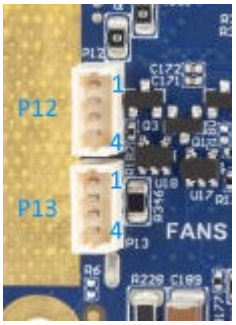
Fan Connectors

The Forge has 4 Fan connectors available for use with a variety of different fans. Two on the topside (P14, P15) of the card two on the bottom (P12, P13). Note that P14 (topside) is the only connector with the TACH feedback connected to the module and is flagged as primary.

Connectors

Function	12V Fan Connectors
Location	P12, P13, P14, P15
Type	4 pin PicoBlade (vertical)
Connector	Part Number: 53047-0410 Manufacturer: Molex
Mating Cable	Part Number: 51021-0400 (housing), 50058-8000 (contact) Manufacturer: Molex
Pinout	1 – GND 2 – 12V Power 3 – TACH feedback (P12 and P14 only) 4 – PWM from module to fan
Notes	P12 (bottom) and P14 (top) are the Primary 12V fan connectors with TACH feedback, all others do not have TACH feedback connected. The Fan control application configuration within the BSP (nvfancontrol) needs to be tuned specifically to the TACH feedback and temperature settings required for the specific system and fan when using closed loop mode. If open loop mode is used the initial 0 temp reading will be the PWM percentage sent to the fan regardless of temp readings if you want a steady value. Do not connect P12 and P14 at the same time from different fans if the fan is using the TACH feedback as the signals will conflict. Simply remove the TACH feedback wire from the fan if there is a conflict. Fan power available across all four connectors is 3A @12V.

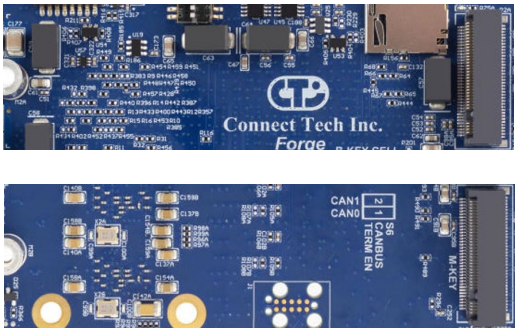




M.2 M-Key 2280 expansion slots

The Forge has two M.2 M-Key 2280 sized expansion slots with x4 PCIe Gen 3 interface for use with an NVMe or M-key compatible devices.

Connectors

Function	M.2 M-Key 2280 Connectors	
Location	P2A, P2B	
Type	M.2 67pin 8.5mm	
Connector	10131758 series Amphenol	
Pinout	Refer to M.2 M-key specification	
Notes	Capable of x4 PCIe Gen 3 speeds.	

M.2 B-Key 3042/3052 expansion slot

The Forge has one M.2 B-Key 3042/3052 sized expansion slots with USB2 and USB 3.2 interface for use with an LTE or 5G Modem.

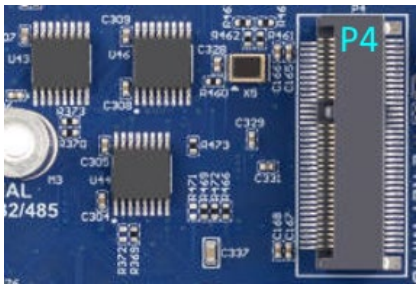
Connectors

Function	M.2 B-Key 3042/3052 Connector	
Location	P8	
Type	M.2 67pin 8.5mm B-key	
Connector	10128796 series Amphenol	
Pinout	Refer to M.2 B-key specification	
Notes	Includes J3 3FF (micro) top loading SIM card holder. USB2/3 Only, No PCIe is available on this B-Key interface	

M.2 E-Key 2230 expansion slot

The Forge has one M.2 E-Key 2230 sized expansion slots with USB2 and x1 PCIe Gen 3 interface for use with a Wi-Fi and BT expansion card.

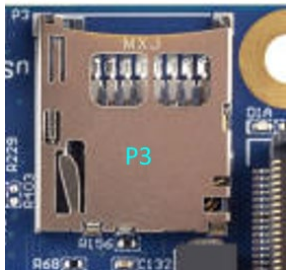
Connectors

Function	M.2 E-Key 2230 Connector	
Location	P4	
Type	M.2 67pin 8.5mm E-key	
Connector	10128797 series Amphenol	
Pinout	Refer to M.2 E-key specification	
Notes	PCIe x1 Gen 3 capable, USB 2.0 only	

Micro SD Card Slot

The Forge has one micro SD card slot.

Connectors

Function	Memory expansion	
Location	P3	
Type	Push-Push Micro SD cards holder	
Connector	502570-0893 from Molex	
Pinout	See Micro SD specification	
Notes	Supported speed grades DS, HS, SDR12, SDR25, SDR50, SDR104, DDR50.	

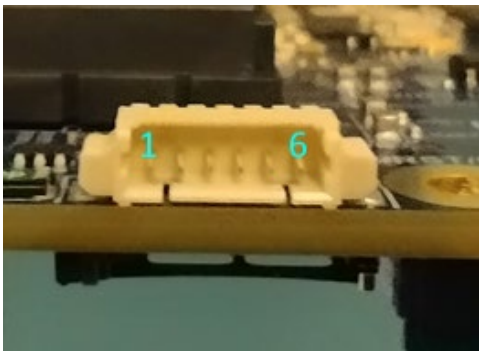
External Switch Access Connector

The Forge has a connector to provide external connections for PWR, RESET and FORCE RECOVERY.

Connectors

Function	External Power/Reset control
Location	P7
Type	6 pin Pico blade
Connector	53261-0671 from Molex
Pinout	

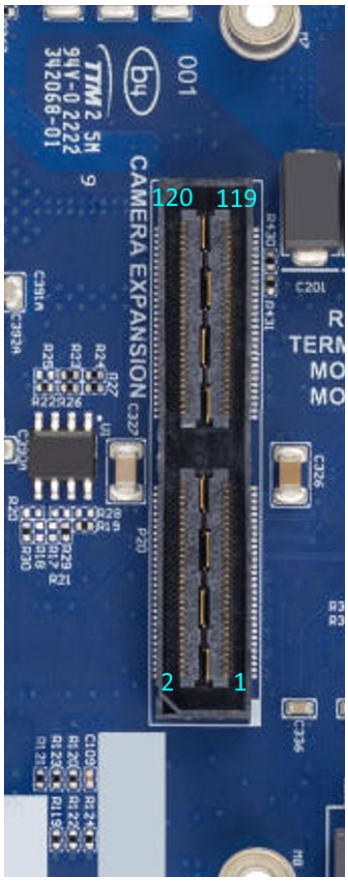
Pin #	Description
1	Force Recovery Button
2	GND
3	Reset Button
4	GND
5	Power Button
6	GND



Notes	Note all signals here are active low and have internal 5.0V 10kohm pullups. Connect to GND to activate.

CAMERA Expansion Connector

Function	8 MIPI CSI-2 Camera Interfaces + I2C and GPIO Control			
Location	P20			
Type	120 Pin QSH with M2.5 mounting standoffs			
Default	Part Number: QSH-060-01-L-D Manufacturer: Samtec			
Mating Connector	QTH			
Pinout	Pin #	Description		Pin #
	1	CSI0_D0_P	CSI1_D0_P	2
	3	CSI0_D0_N	CSI1_D0_N	4
	5	GND	GND	6
	7	CSI0_CLK_P	CSI1_CLK_P	8
	9	CSI0_CLK_N	CSI1_CLK_N	10
	11	GND	GND	12
	13	CSI0_D1_P	CSI1_D1_P	14
	15	CSI0_D1_N	CSI1_D1_N	16
	17	GND	GND	18
	19	CSI2_D0_P	CSI3_D0_P	20
	21	CSI2_D0_N	CSI3_D0_N	22
	23	GND	GND	24
	25	CSI2_CLK_P	CSI3_CLK_P	26
	27	CSI2_CLK_N	CSI3_CLK_N	28
	29	GND	GND	30
	31	CSI2_D1_P	CSI3_D1_P	32
	33	CSI2_D1_N	CSI3_D1_N	34
	35	GND	GND	36
	37	CSI4_D0_P	CSI6_D0_P	38
	39	CSI4_D0_N	CSI6_D0_N	40
	41	GND	GND	42
	43	CSI4_CLK_P	CSI6_CLK_P	44
	45	CSI4_CLK_N	CSI6_CLK_N	46
	47	GND	GND	48
	49	CSI4_D1_P	CSI6_D1_P	50
	51	CSI4_D1_N	CSI6_D1_N	52



	53	GND	GND	54
	55	**+12V**	**+12V**	56
	57	**+12V**	**+12V**	58
	59	CSI5_D0_P	CSI7_D0_P	60
	61	CSI5_D0_N	CSI7_D0_N	62
	63	GND	GND	64
	65	CSI5_CLK_P	CSI7_CLK_P	66
	67	CSI5_CLK_N	CSI7_CLK_N	68
	69	GND	GND	70
	71	CSI5_D1_P	CSI7_D1_P	72
	73	CSI5_D1_N	CSI7_D1_N	74
	75	I2C3_SCL	NC	76
	77	I2C3_SDA	NC (PWM1)	78
	79	GND	GND	80
	81	+2.8V	+2.8V	82
	83	+2.8V	CAM_ERROR2	84
	85	FRSYNC1	PWM02	86
	87	I2C2_SCL	CAM_MCLK3	88
	89	I2C2_SDA	CAM1_PWDN	90
	91	CAM_MCLK2	CAM1_RST#	92
	93	CAM0_PWDN	CAM_MCLK4	94
	95	CAM0_RST#	FRSYNC4	96
	97	FRSYNC3	FRSYNC2	98
	99	GND	GND	100
	101	RSVD	1.8V	102
	103	NC	NC	104
	105	I2C5_SCL	NC	106
	107	I2C5_SDA	3.3V	108
	109	PWM01	3.3V	110
	111	NC	NC	112
	113	NC	NC	114
	115	GND	GND	116
	117	NC	3.3V	118
	119	CAM_AVDD_EN	3.3V	120

Notes	Only 6 of the CSI2 interfaces can be used at once in 2 lane configurations. Only 4 interfaces when using 4 lane configurations. Note that up to 16 Cameras can be used using virtual channels. All non-CSI-2 I/O is 1.8V levels. Power available on the Camera connector 12V => 3A Max (4 pins) 1.8V => 1A Max (1 pin) 2.8V => 3A (3 pins) 3.3V => 3A Max (4 pins) CAUTION! – The 12V pins shown above differ from that of the NVIDIA® dev kit pinout.

GPIO/SPI/I2C/UARTs

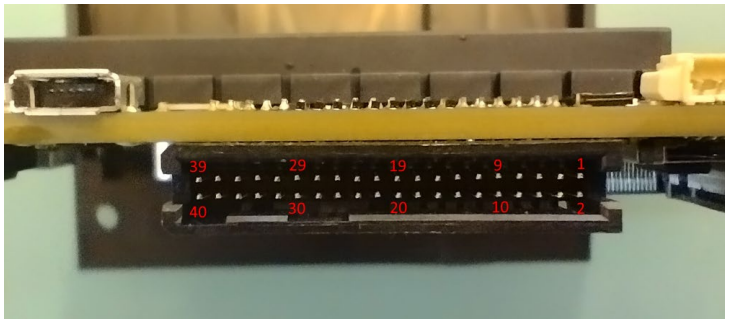
Several General purpose I/O features are available on this interface including: 2x SPI, 2xI2C, 2xUART, 4xGPOut, 4xGPIn, 2xPWM_Out, 2xRS232/485.

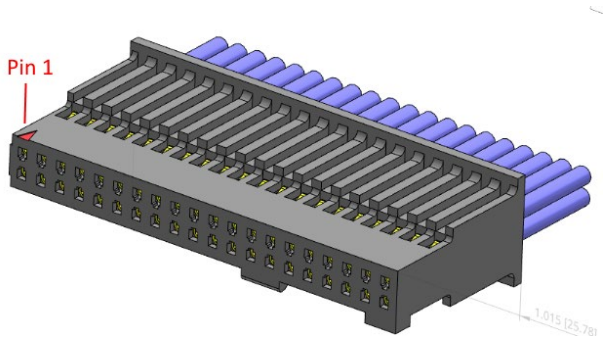
Connectors

Function	General Purpose I/O
Location	P17
Type	40 pin General Purpose 3.3V I/O Connector (note: All I/O are 3.3V levels except the RS232/RS485 interfaces)
Connector	Samtec TFML-020 series
Mating Cable	SFSD-20-28-G-12.00SL (SL or DL = Friction Lock required for locking fit)

Pinout

Pin #	Description	Description	Pin #
1	3V3 Power Output (1A)	GND	2
3	SPI1_CLK	SPI1_MOSI	4
5	SPI1_CS0#	SPI1_MISO	6
7	SPI2_CLK	SPI2_MOSI	8
9	SPI2_CS0#	SPI2_MISO	10
11	GND	GND	12
13	TTL_UART1_TX	TTL_UART2_TX	14
15	TTL_UART1_RX	TTL_UART2_RX	16
17	I2C1_CLK	I2C2_CLK	18
19	I2C1_SDA	I2C2_SDA	20
21	GP_Out_0	GP_In_0	22





23	GP_Out_1	GP_In_1	24
25	GP_Out_2	GP_In_2	26
27	GP_Out_3	GP_In_3	28
29	PWM_Out_0	PWM_Out_1	30
31	GND	GND	32
33	RS232A_TX/ RS485A_TXP	RS232A_RX/ RS485A_RXP	34
35	RS232A_RTS/ RS485A_TXN	RS232A_CTS/ RS485A_RXN	36
37	RS232B_TX/ RS485B_TXP	RS232B_RX/ RS485B_RXP	38
39	RS232B_RTS/ RS485B_TXN	RS232B_CTS/ RS485B_RXN	40

Notes:

All I/O are 3.3V unless otherwise specified.

GP_Out_*x* - are driven outputs and can sink or source 12mA

GP_In_*x* - VIH (Input High Voltage minimum) = 2V. No pullup or pulldown is pre-configured, user discretion to add externally if required for their application.

PWM_Out_x - are driven outputs and can sink or source 24mA

3V3 Power output can provide up to 1A of current.

SW Cross reference to GPIO controllers

Connector Name	Module ID	Controller ID (sysfs)
GP_IN_0	GPIO01	PG.03 (386)
GP_IN_1	GPIO04	PA.02 (350)
GP_IN_2	GPIO05	PA.01 (349)
GP_IN_3	GPIO08	PBB.01 (325)
GP_OUT_0	GPIO09	PBB.00 (324)
GP_OUT_1	GPIO11	PAC.05 (491)
GP_OUT_2	GPIO17	PP.04 (444)
GP_OUT_3	GPIO18	PQ.04 (452)

Connector Name	SW /dev ID	DTB ID (name)
PWM_OUT_0	pwm8	pwm@32f0000 (PR.00)
PWM_OUT_1	pwm5	pwm@32c0000 (PH.00)

SW Interface Cross reference

Connector Name	SW /dev ID	DTB ID
I2C1	i2c0	i2c@3160000
I2C2	i2c7	i2c@c250000
UART1	ttyTHS0	serial@3100000
UART2	ttyTHS4	serial@3140000
RS232A	ttyTHS1	serial@3110000
RS232B	ttyTHS3	serial@3130000
SPI1	spi0	spi@3210000
SPI2	spi1	spi@c260000

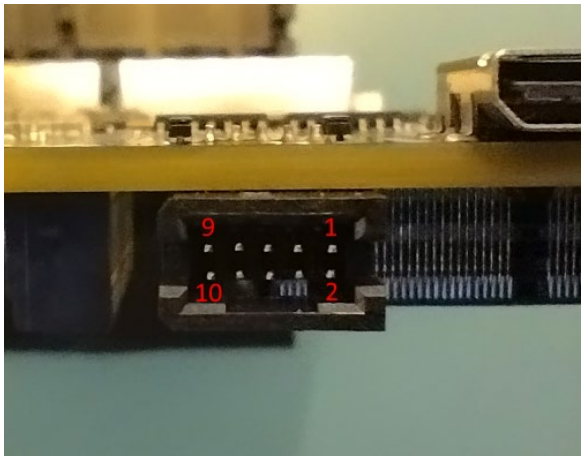
CAN BUS Interfaces

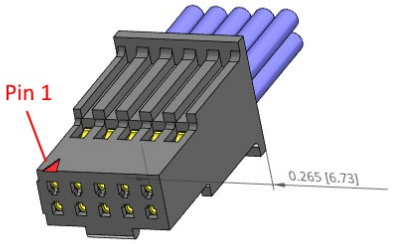
Two non-isolated CAN Bus interfaces are available on

Connectors

Function	CAN Bus Interface
Location	P18
Type	10 pin dual CAN Bus Connector
Connector	Samtec TFML-05 series
Mating Cable	SFSD-05-28-G-12.00SL (SL or DL = Friction Lock required for locking fit)
Pinout	
Notes	Connector pinout allows for it to be rotated without causing damage.

Pin #	Description	Description	Pin #
1	CAN0_H	CAN0_L	2
3	GND	GND	4
5	NC	NC	6
7	GND	GND	8
9	CAN1_L	CAN1_H	10





TYPICAL INSTALLATION

The Forge is an NVIDIA® Jetson AGX Orin™ based carrier that can be configured in a variety of ways to suit the users environment and feature set. The basic install and power up conditions are as follows:

Ensure all external system power supplies are off.

1. Install the NVIDIA® Jetson AGX Orin™ Module onto the Molex Mirror Mezz™ Connector. Be sure to follow proper installation of mounting hardware, heatsink/heatspreader, and any other applicable requirements from the manufacturer.

2. Install the necessary cables for application. At a minimum these would include:

   a) Power cable to the input power connector on the carrier
   b) Displayport video display cable
   c) Keyboard and mouse via a USB port
      or
   d) Connect only the micro USB debug serial port (no display or keyboard and mouse are necessary) to get a terminal connection from a remote source.

   For additional information on the relevant cables, please see the Cables and Interconnects section of this manual.

3. Connect the Power Cable to the Power Supply.

Switch ON the Power Supply. DO NOT power up your system by plugging in live power.

FORCE RECOVERY MODE

The USB 3.2/OTG Port (P11A) of the Forge can be used to reprogram the AGX ORIN™ from another host platform running NVIDIA® Jetpack™.

1) Power down the system completely. The system power MUST be OFF, not in suspend or sleep mode.
2) Connect the OTG USB port to another host device that will be supplying the new system file.
3) Hold down the Force Recovery Button (S3) and then power the board.
4) After three (3) seconds release the Recovery button.
5) The AGX ORIN™ will show up on the host system USB list as a new NVIDIA® target device.
6) After successfully updating the system software, power off the system. A clean power up will revert the OTG port back into host mode.

WEIGHT

Forge configuration	Weight in grams
AGX201 Board only (no module) with 10G Heat spreader (TTP) attached.	280g
AGX201 with Module and full active heatsink solution installed	990g

POWER CONSUMPTION & THERMALS

Below is the theoretical maximum stand-alone power requirements of the Forge Carrier with the Jetson AGX ORIN™ 32GB Module installed.

Minimum External System Power Requirements (tested)	Watts
Fully utilized AGX201 Tested configuration: - Jetson AGX ORIN™ 32GB in MAXN running 'gpu_burn' with tensor cores, and CPU stress on unused processors = 68W - USB 3.2 load 5V@3A each = 30W - 2x 10GbE linked = 6W - 2x 1GbE linked = 3W - 8x GMLS Camera with PoC (12V Power over coax) = 40W - 2x NVMe (running stress) = 12W - 1x Wi-Fi = 2W - 1x LTE = 4W *Note this is with all devices powered through the Forge (AGX201). This is not the dissipation of the AGX201 itself. This includes all add-on modules and power provided to external USB and external Camera devices. Use as a guideline to gauge your system power requirements. More overhead power may be required for transient conditions. For example: The **MSG103** CTI supplied power brick designed for 250W will handle the power overhead requirements.	166W

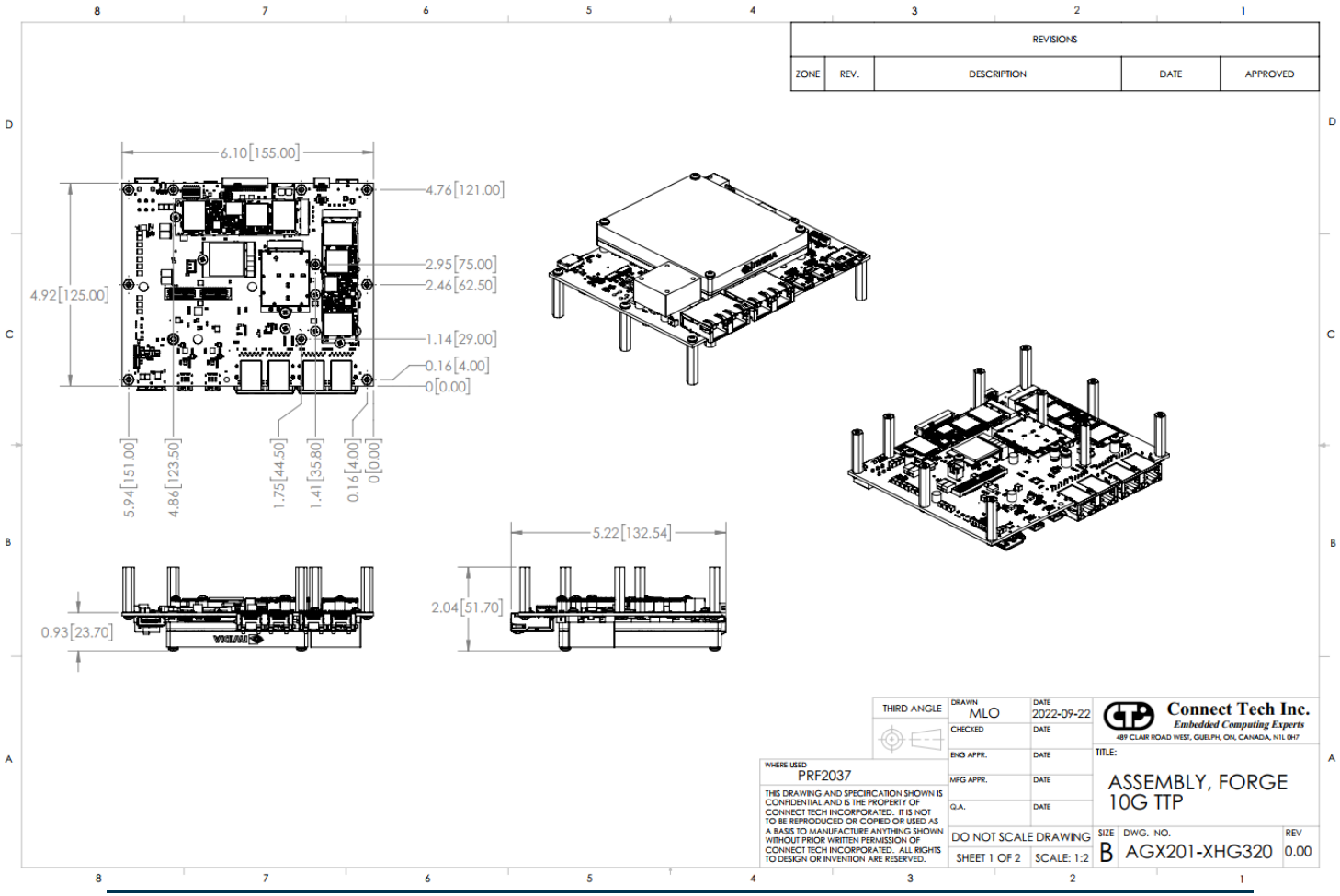
The typical power dissipation will vary depending on the application and use case. Here are some example systems tested at room temperature in maximum load conditions.

Maximum System power configuration	Breakdown (Watts)	Total Watts
AGX ORIN™ (MAXN Power Mode) - CUDA 'gpu_burn' with tensor cores benchmark	Jetson AGX ORIN™ 32GB = 68W AGX201 PSU losses + residuals = 12W	80W
AGX ORIN™ (MAXN Power Mode) - CUDA 'gpu_burn' with tensor cores benchmark - 2x 10GbE linked - 2x 1GbE linked	Jetson AGX ORIN™ 32GB = 68W AGX201 PSU losses + residuals = 15W 2x 10GbE devices = 6W 2x 1GbE devices = 3W	94W

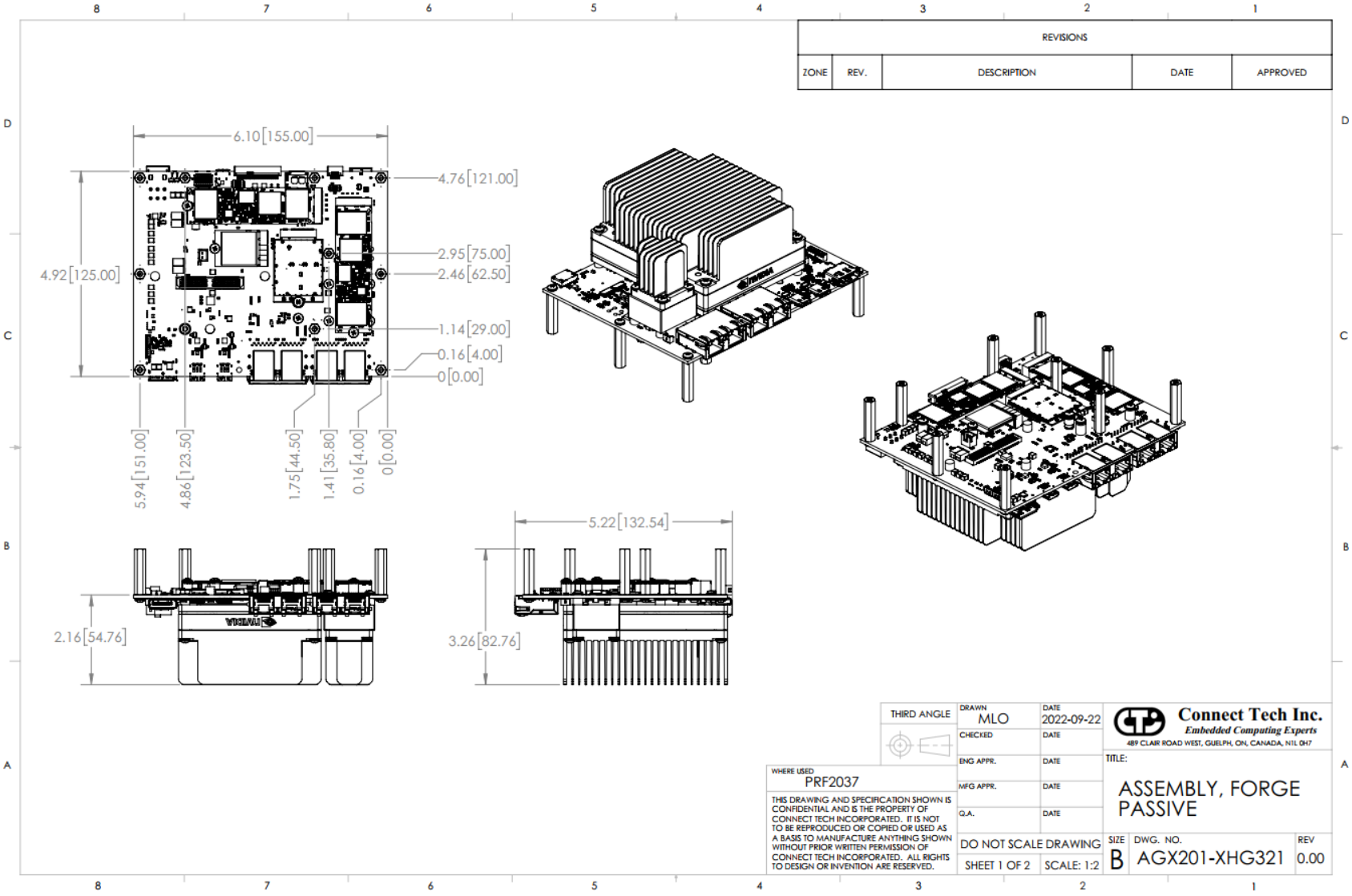
MECHANICAL DRAWINGS & MODELS

Heatsink and Module mounting (CTI provided HW):

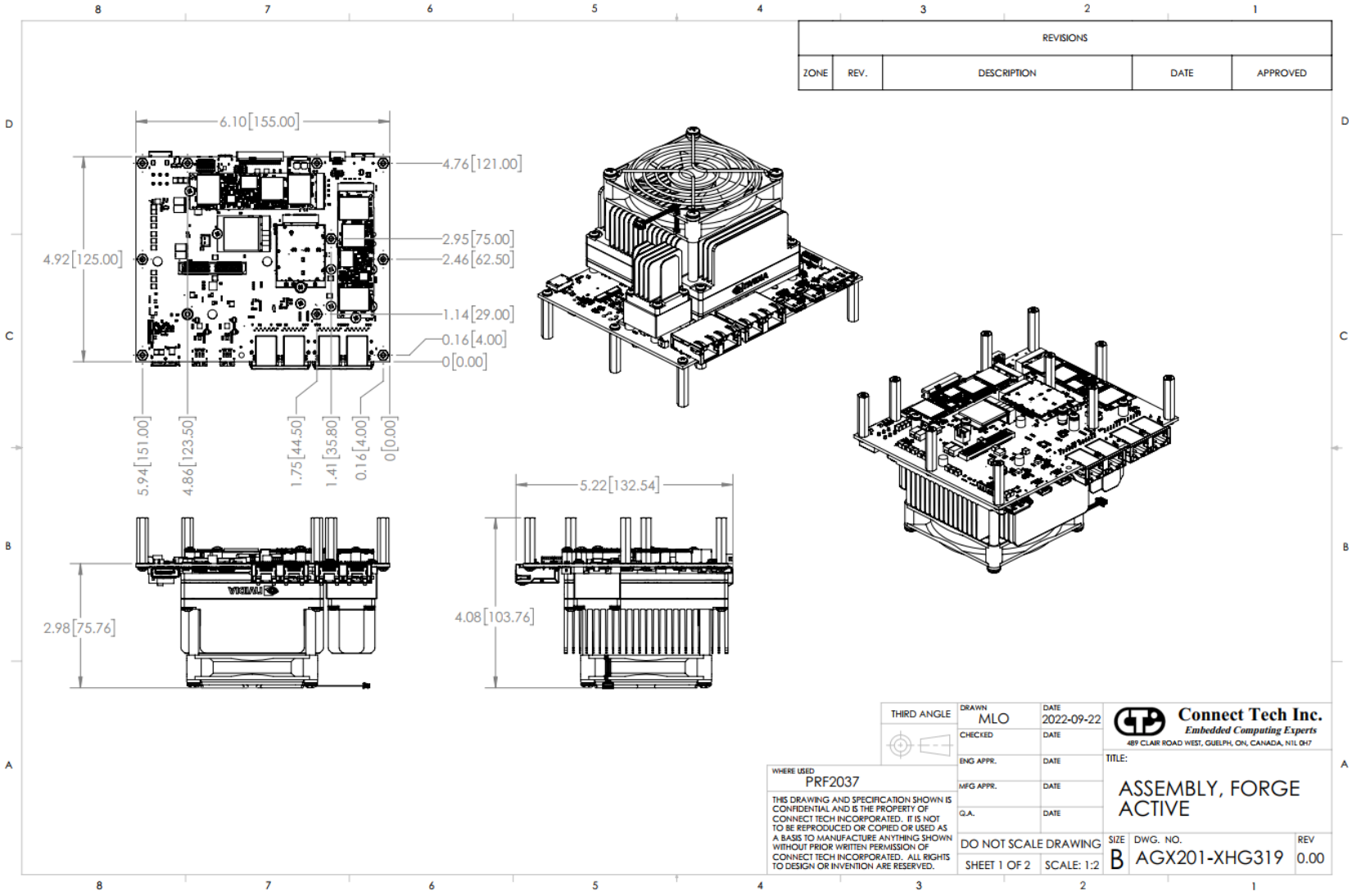
Basic Module integration with required 10G TTP (allowing for a user applied thermal interface)



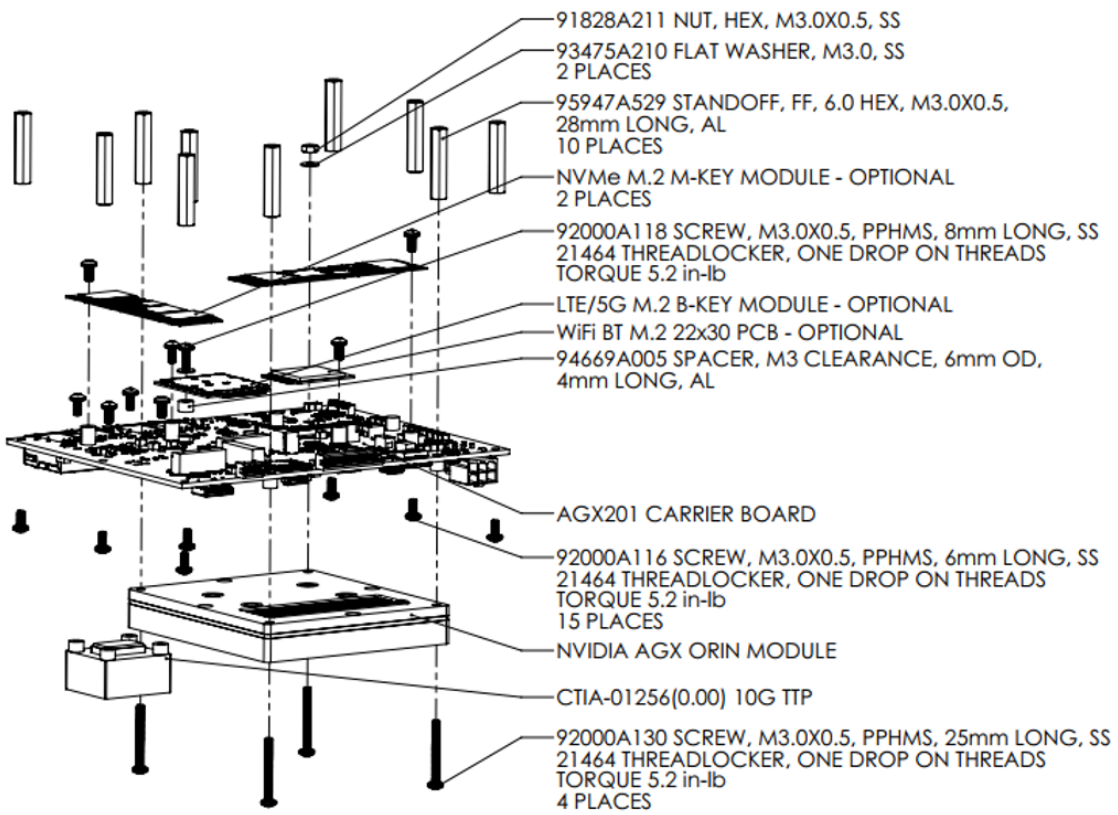
Passive (user supplied airflow)



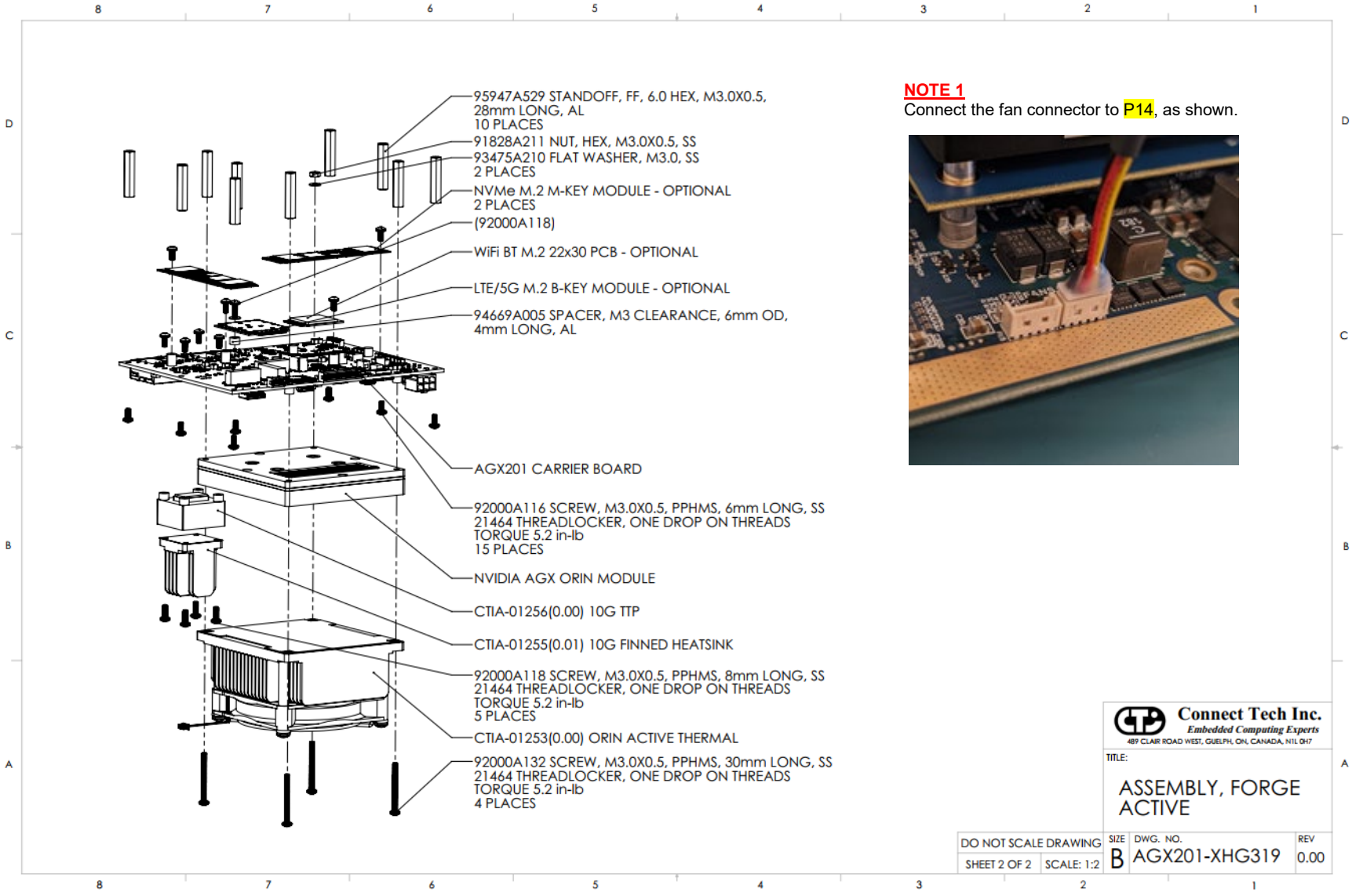
Active Thermal standalone solution:



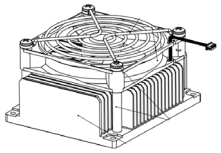
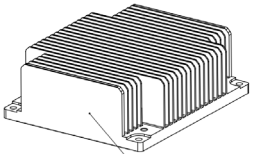
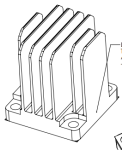
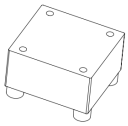
Basic Module only fastener mounting details:



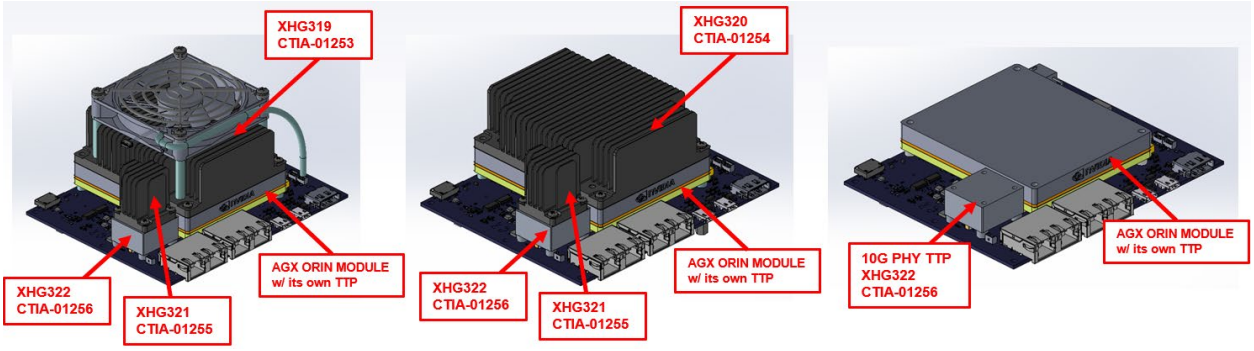
Active Cooled system fastener mounting details:



Off The Shelf Thermal Part Numbers

Image	Sales PN	Drawing PN	Description
	**XHG319**	**CTIA-01253**	AGX Orin™ Active Thermal
	**XHG320**	**CTIA-01254**	AGX Orin™ Passive Thermal
	**XHG321**	**CTIA-01255**	Forge 10G PHY Finned Heatsink
	**XHG322**	**CTIA-01256**	Forge 10G PHY TTP *Note: This is pre-installed on all AGX201 and AGX201-XXX builds*

Views and Callouts of Forge Thermals in Integrations



Notes on Thermal Data

The AGX201 product ships with a pre-integrated 10G Ethernet PHY TTP (Thermal Transfer Plate). This much like the NVIDIA® JETSON TTP will require additional thermal relief and is not intended to be used as a final thermal solution.

Thermal Details of Dual 10G PHY TTP

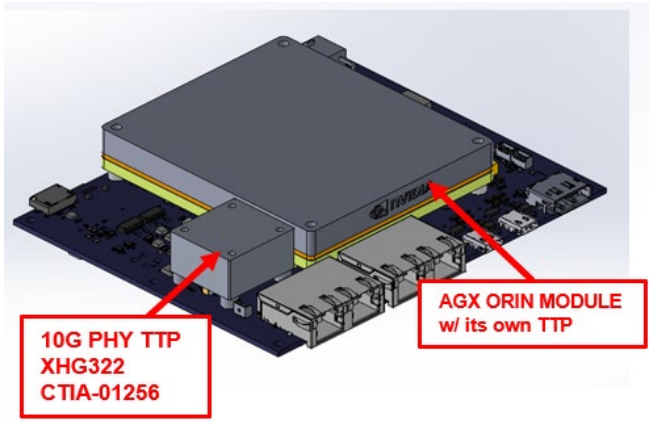
Symbol	Parameter	Test Condition	10G[1]	5G[2]	2.5G[3]	Units
$P_{TOTAL\_MAX\_SS}$	Power	Steady-State (maximum)	5.704	4.104	2.792	W

1. Maximum supplies, 100 meters CAT 6A, TJ=108°C
2. Maximum supplies, 100 meters CAT 6A, TJ=108°C
3. Maximum supplies, 100 meters CAT 6A, TJ=108°C

NOTE: Best practice would be to account for a maximum of 6W, and to keep top surface of 10G PHY TTP limited to 80°C

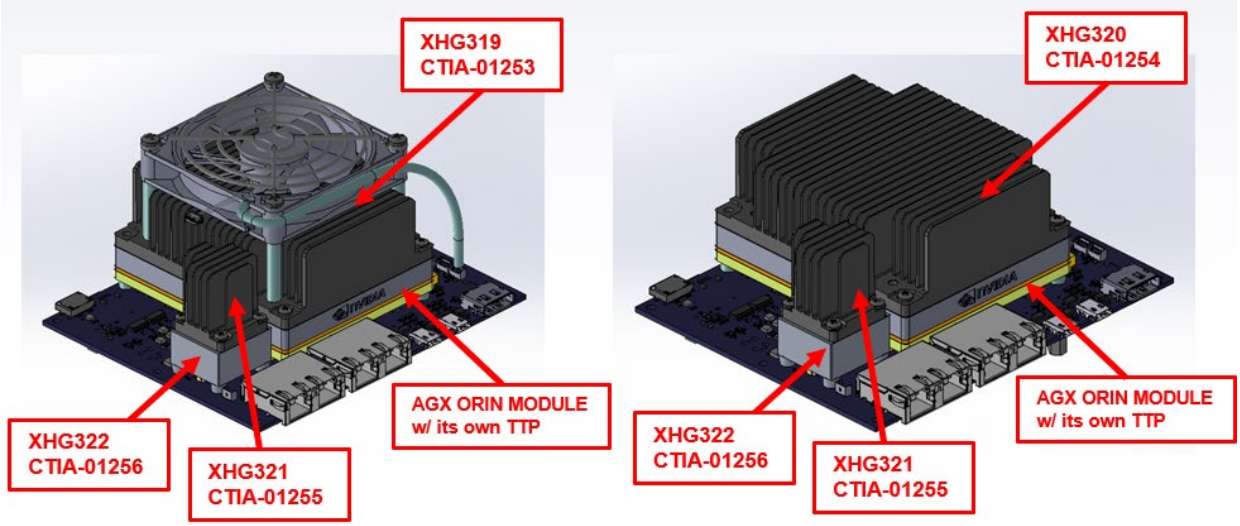
Conduction Cooling Recommendation

For conditioning cooling Connect Tech Recommends to have both the 10G PHY TTP and the NVIDIA® Jetson Module TTP attached to a surface that can provide adequate relief to keep top surfaces of both TTPs under 80°C.



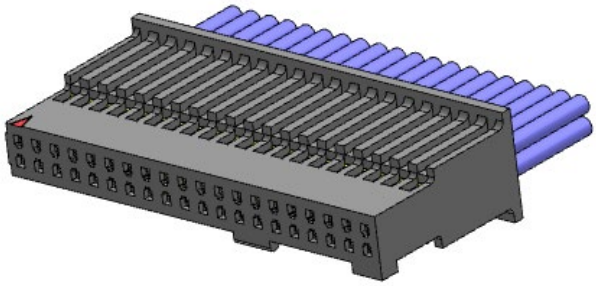
Active / Forced Air Cooling Recommendations

For Active and Forced Air Cooling Connect Tech recommends the use of their XHG321 - 10G PHY Finned Heatsink in conjunction with the XHG319 Active or XHG320 Passive Heatsinks as shown below.

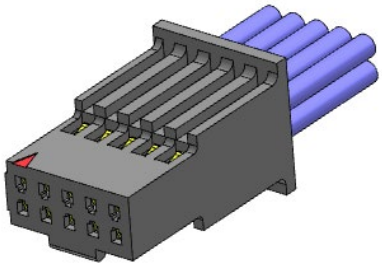


CABLES

SFSD-20-28-G-x.xx-SL (GPIO connector) – 12” breakout cable with flying leads is supplied with the board purchase.



SFSD-05-28-G-x.xx-SL (CAN Bus) – 12” breakout cable with flying leads is supplied with the board purchase.



0451350603 (POWER) – 12” 6 pin to 6 pin Mini-Fit Jr for use with power connections is supplied with the board purchase.