Connect Tech Inc.

Embedded Computing Experts

USERS GUIDE

Rudi-AGX

CTIM-00051 Revision 0.02 2021-11-17

NVIDIA ELITE PARTNER

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 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 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.

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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	2021-03-01	Preliminary Release
0.01	2021-03-22	Edited Operating Temperature
0.02	2021-11-17	Updated Company Address

INTRODUCTION

Built to deploy massive AI workloads at the Edge, Rudi-AGX is the AI supercomputer guaranteed to stay cool - even at AGX Xavier's MAX-N. Rudi-AGX can withstand even the most compute intensive AI applications with its power-efficient and feature rich design. Seamlessly deploy your next generation autonomous vehicle, smart city application, or intelligent vision solution with this state-of-the-art NVIDIA Jetson AGX Xavier supercomputer.

Product Features and Specifications

Specifications	
Product Name	**Rudi-AGX**
Module Compatibility	NVIDIA® Jetson AGX Xavier™
Mechanical Dimensions	177.8 mm x 177.8 mm x 107.95 mm (7" x 7" x 4.25")
USB	4x USB 3.0 (Connector: USB Type-A) 1x USB 3.0 w/ OTG (Connector: USB Type-C) 1x USB 3.0 + 2.0 Port to M.2 B-Key 1x USB 2.0 to M.2 E-Key
GMSL Cameras	8x GMSL 1/2 Camera Inputs (Connector: 2x Quad Micro COAX) Deserializers Embedded On Carrier Board
Networking	2x 10/100/1000BASE-T Uplink (1 Port From PCIe PHY Controller, 1 Port From RGMII PHY Controller)
Storage	1x NVMe (M.2 2280 M-KEY) 1x M.2 2280 M-Key Slot Free 1x SD Card Slot
Wireless Expansion	1x WiFi Module (M.2 2230 E-KEY) 1x LTE Module (M.2 3042 B-KEY) w/ SIM Card Connector
Video Output	2x HDMI
Misc. I/O	2x UART (1x Console, 1x 1.8V) 1x RS-485 2x I2C 2x SPI 2x PWM 4x GPIO 3x 5V 3x 3.3V 8x GND
CAN	2x Isolated CAN 2.0b
RTC Battery	CR2032 Battery Holder

Pushbutton	Reset and Force Recovery
Status LED	Power Good LEDs
Power Input	+9V to +36V DC Power Input (Mini-Fit Jr. 4-Pin Locking)
Operating Temperature	-25 C to +40 C with Minimum Airflow of 0 CFM -25 C to +60 C with Minimum Airflow of 125 CFM
Weight	3.22kg, 7.1 lbs
Warranty and Support	1 Year Warranty and Free Support

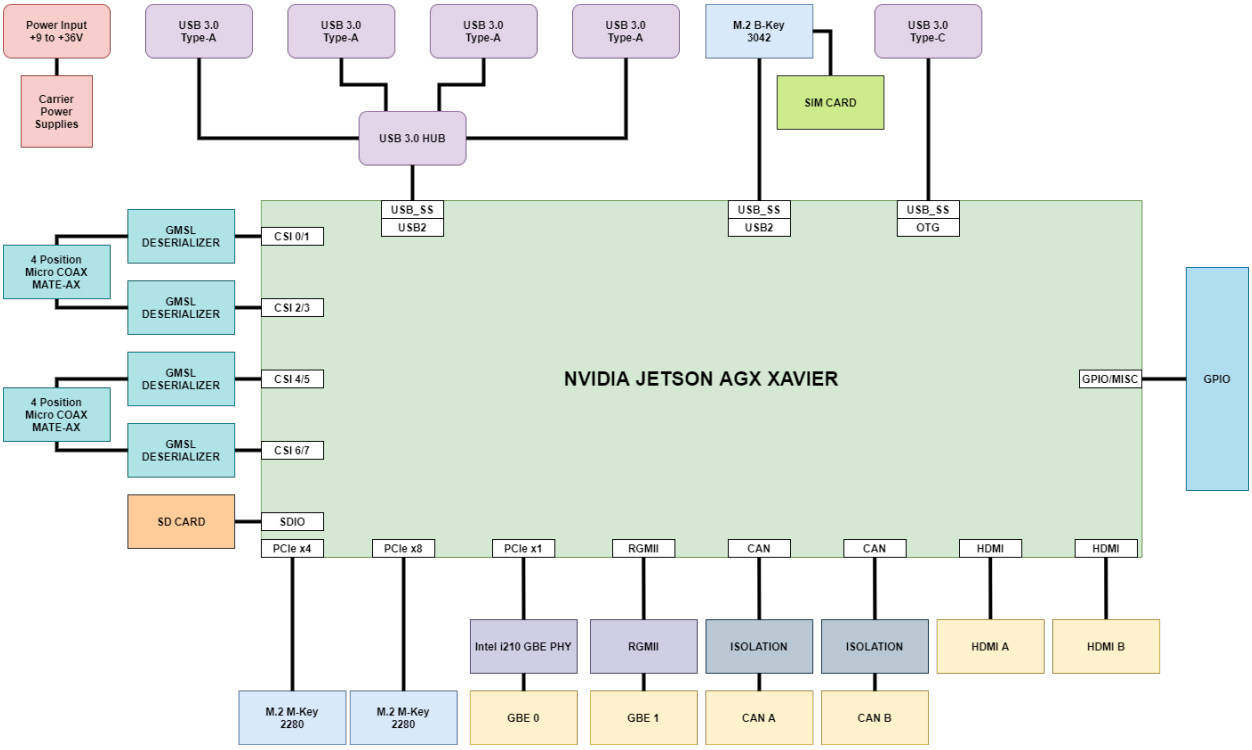
Part Numbers / Ordering Information

Part Number		
Part Number	**Description**	**Installed Modules**
ESG610-01	Rudi-AGX	None
ESG610-02	Rudi-AGX with WiFi/BT	M.2 2230 WiFi/BT – PN: 8265NGW
ESG610-03	Rudi-AGX with NVMe	M.2 2280 NVMe – PN: MZ-V7S1T0B/AM
ESG610-04	Rudi-AGX with WiFI/BT and NVMe	M.2 2230 WiFi/BT – PN: 8265NGW M.2 2280 NVMe – PN: MZ-V7S1T0B/AM
ESG610-05	Rudi-AGX with LTE EMEA	M.2 3042 LTE-EMEA – PN: EM06-E
ESG610-06	Rudi-AGX with WiFi/BT and LTE EMEA	M.2 2230 WiFi/BT – PN: 8265NGW M.2 3042 LTE-EMEA – PN: EM06-E
ESG610-07	Rudi-AGX with NVMe and LTE EMEA	M.2 2280 NVMe – PN: MZ-V7S1T0B/AM M.2 3042 LTE-EMEA – PN: EM06-E
ESG610-08	Rudi-AGX with WiFi/BT, NVMe, and LTE EMEA	M.2 2230 WiFi/BT – PN: 8265NGW M.2 2280 NVMe – PN: MZ-V7S1T0B/AM M.2 3042 LTE-EMEA – PN: EM06-E
ESG610-09	Rudi-AGX with LTE JP	M.2 3042 LTE-JP – PN: EM06-J
ESG610-10	Rudi-AGX with WiFi/BT and LTE JP	M.2 2230 WiFi/BT – PN: 8265NGW M.2 3042 LTE-JP – PN: EM06-J
ESG610-11	Rudi-AGX with NVMe and LTE JP	M.2 2280 NVMe – PN: MZ-V7S1T0B/AM M.2 3042 LTE-JP – PN: EM06-J
ESG610-12	Rudi-AGX with WiFi/BT, NVMe, and LTE JP	M.2 2230 WiFi/BT – PN: 8265NGW M.2 2280 NVMe – PN: MZ-V7S1T0B/AM M.2 3042 LTE-JP – PN: EM06-J
ESG610-13	Rudi-AGX with LTE NA	M.2 3042 LTE-NA – PN: EM06-A

ESG610-14	Rudi-AGX with WiFI/BT an LTE NA	M.2 2230 WiFi/BT – PN: 8265NGW M.2 3042 LTE-NA – PN: EM06-A
ESG610-15	Rudi-AGX with NVMe and LTE NA	M.2 2280 NVMe – PN: MZ-V7S1T0B/AM M.2 3042 LTE-NA – PN: EM06-A
ESG610-16	Rudi-AGX with WiFI/BT, NVMe, and LTE NA	M.2 2230 WiFi/BT – PN: 8265NGW M.2 2280 NVMe – PN: MZ-V7S1T0B/AM M.2 3042 LTE-NA – PN: EM06-A

PRODUCT OVERVIEW

Block Diagram



Connector Summary & Locations

FRONT VIEW

REAR VIEW

BOTTOM VIEW (COVER REMOVED)

Internal Connector Summary

Designator	Connector	Description
P1	0353180420	+9V to +36V Mini-Fit Jr. 4-Pin DC Power Input Connector
P2	SM3ZS067U410ABR1000	M.2 3042 B-Key 2G/3G/LTE Cellular Module Connector
P3	SM3ZS067U410AER1000	M.2 2230 E-Key WiFi/Bluetooth Module Connector
P4A P4B	1-2199230-5 1-2199119-5	M.2 2280 M-Key NVMe SSD Connector
P5A P5B	2007435-3	HDMI Video Connector
P6	JXD1-2015NL	Dual RJ-45 Gigabit Ethernet Connector
P7	0475530001	SIM Card Connector
P8A P8B	2304168-9	GMSL 1/2 Quad FAKRA Camera Connector
P9A P9B	TFM-103-02-L-DH-TR	6 Pin Isolated CAN Connector
P10	TFM-120-02-L-DH-TR	40 Pin GPIO Connector
P11	10067847-001RLF	SD Card Connector
P12A P12B	48404-0003	USB3.0 Type-A Connector
P13A P13B	48404-0003	USB3.0 Type-A Connector
P14	632723300011	USB3.0 Type-C Connector w/ OTG
P15	203456-0003	699 Pin Mirror Mezz Xavier AGX Connector
BAT1	BHSD-2032-SM	CR2032 RTC Battery Connector

External Connector Summary

Location	External Connector	Description
Front	PWR IN	+9V to +36V Mini-Fit Jr. 4-Pin DC Power Input Connector
Front	HDMI 1, 2	HDMI Video Connectors
Back	OTG	USB 3.0 Type-C OTG Connector
Back	GbE1, GbE2	Dual RJ-45 Gigabit Ethernet Connector
Front	SD CARD	SD Card Connector
Front	SIM CARD	SIM Card Connector
Back	USB 1, 2, 3, 4	USB3.0 Type-A Connector
Front	EXPANSION I/O	40 Pin GPIO Connector
Front	GMSL 1, 2	GMSL 1/2 Quad Camera Connectors
Front	CAN A, B	6 Pin Isolated CAN Connectors
Front	RESET FORCE RECOVERY	Reset and Force Recovery Pushbuttons
Back	ANT 1, 2	Antenna
Front	ANT 3, 4	Antenna

Jumper Summary & Locations

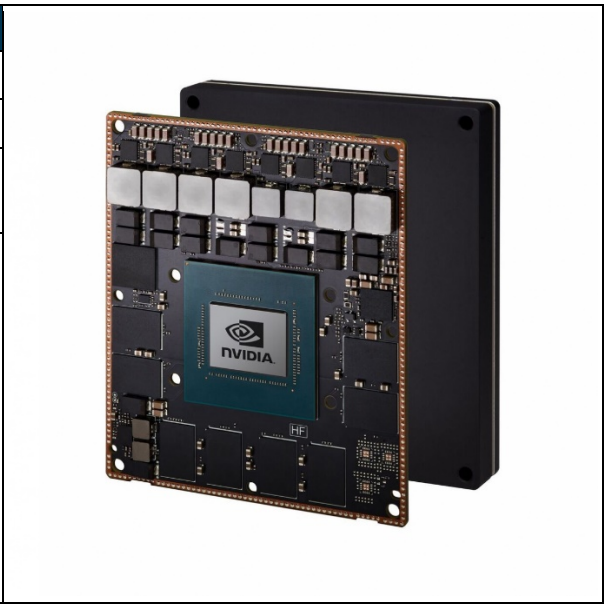
Designator	Connector	Description
SW2 SW3	TL1260BQRBLK	Reset and Force Recovery Pushbuttons

DETAILED FEATURE DESCRIPTION

Rudi-AGX NVIDIA® Jetson AGX Xavier™ Module Connector

The NVIDIA® Jetson AGX Xavier™ processor and chipset are implemented on the Jetson AGX Xavier™ Module. This connects to the AGX Xavier module to the Rudi-AGX via Molex Mirror Mezz 699 pin connector.

Function	Description
Location	Embedded within Rudi-AGX
Type	Module
Pinout	Refer to NVIDIA® Jetson AGX Xavier™ Datasheet.
Features	Refer to NVIDIA® Jetson AGX Xavier™ Datasheet.



Note: A Thermal Transfer Plate is incorporated on the NVIDIA® Jetson AGX Xavier™ module that dissipates heat through the top of the Rudi-AGX Chassis.

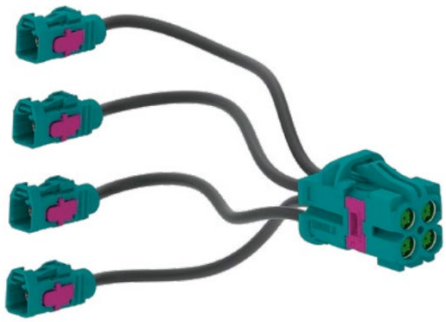
Rudi-AGX HDMI Connector

The NVIDIA® Jetson AGX Xavier™ module will output video via the dual vertical HDMI connectors that are HDMI 2.0 capable.

Function	Description
Location	Front
Type	HDMI Vertical Connector
Mating Connector	HDMI Type-A Cable
Pinout	Refer to HDMI Standard

Rudi-AGX GMSL 1/2 Connector

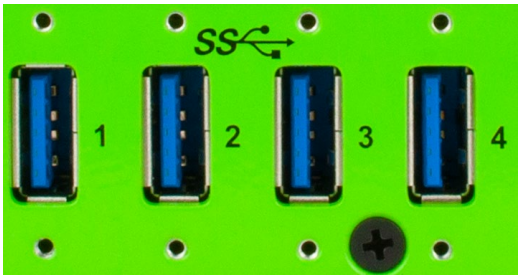
The Rudi-AGX allows GMSL 1 or GMSL 2 through the Quad MATE-AX connectors. The GMSL to MIPI Deserializers are embedded on the carrier board which use 4-Lane MIPI video per 2 cameras. Additionally, the Rudi-AGX outputs +12V Power Over COAX (POC).

Function	Description	
Location	Front	
Type	GMSL 1/2 Camera Connectors	
Mating Cable	Quad Fakra GMSL Cable 4 Position MATE-AX to 4 x FAKRA Z-code 50Ω RG174 Cable CTI P/N: CBG341	

Rudi-AGX USB 3.0 Type-A Connector

The Rudi-AGX incorporates 4 vertical USB 3.0 Type-A connectors with a 2A current limit per connector. All USB 3.0 Type-A ports are 5Gbps capable.

Function	Description
Location	Rear
Type	USB Type-A Connector
Mating Connector	USB Type-A Cable
Pinout	Refer to USB Standard



Rudi-AGX 10/100/1000 Dual Ethernet Connector

The Rudi-AGX implements 2 x RJ-45 ethernet connectors for internet communication. Connector A is connected to the AGX module through an RGMII PHY. Connector B is connected through a i210 PCIe Gigabit Ethernet PHY to the AGX module.

Function	Description
Location	Rear
Type	RJ-45 Connector
Mating Connector	RJ-45 Ethernet Cable
Pinout	Refer to Ethernet Standard

Rudi-AGX USB 3.0 Type-C Connector w/ OTG

The Rudi-AGX implements a USB3.0 Type-C connector to allow host mode access to the module or OTG flashing of the module.

Function	Description
Location	Rear
Type	Type-C USB Connector
Mating Connector	USB 3.0 Type-C
Pinout	Refer to USB Standard

Rudi-AGX SD Card Connector

The Rudi-AGX implements a Full-Size SD Card connector.

Function	Description
Location	Front
Type	SD Card Connector
Pinout	Refer to SD Card Standard

Rudi-AGX SIM Card Connector

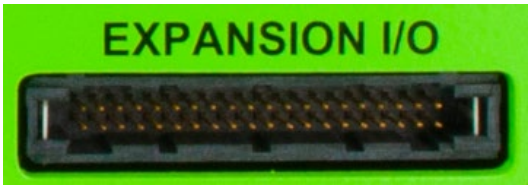
The Rudi-AGX implements a Standard Size SIM Card connector.

Function	Description
Location	Front
Type	SIM Card Connector
Pinout	Refer to SIM Card Standard

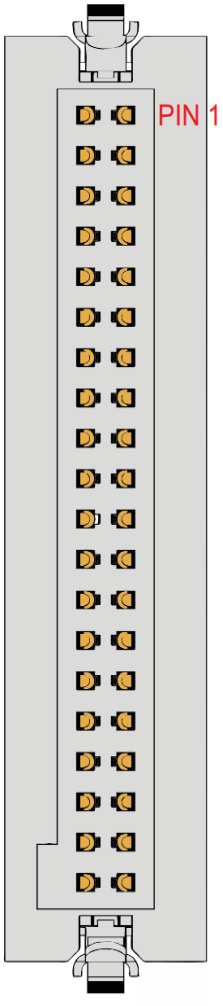
Rudi-AGX GPIO Connector

The Rudi-AGX implements a Samtec TFM-120-02-L-DH-TR Connector to allow for additional user control. 3x Power (+5V, +3.3V), 9x Ground, 6x GPIO (GPO12, GPO13, GPI14, GPI17, GPO18, GPI19), 2x I2C (I2C0, I2C2), 2x SPI (SPI0, SPI1), 2x UART (3.3V, Console), and RS485 interfaces.

Function	Description
Location	Front
Type	GPIO Expansion Connector
Carrier Connector	TFM-120-02-L-DH-TR
Mating Cable	SFSD-20-28C-G-12.00-SR



Pinout	Colour	Description	I/O Type
1	Brown	+5V	Power
2	Red	SPI0_MOSI (**3.3V Max.**)	O
3	Orange	SPI0_MISO (**3.3V Max.**)	I
4	Yellow	SPI0_SCK (**3.3V Max.**)	O
5	Green	SPI0_CS0# (**3.3V Max.**)	O
6	Violet	+3.3V	Power
7	Gray	GND	Power
8	White	SPI1_MOSI (**3.3V Max.**)	O
9	Black	SPI1_MISO (**3.3V Max.**)	I
10	Blue	SPI1_SCK (**3.3V Max.**)	O
11	Brown	SPI1_CS0# (**3.3V Max.**)	O
12	Red	GND	Power
13	Orange	UART_DEBUG_TX (**3.3V Max.**, Console)	O
14	Yellow	UART_DEBUG_RX (**3.3V Max.**, Console)	I
15	Green	GND	Power

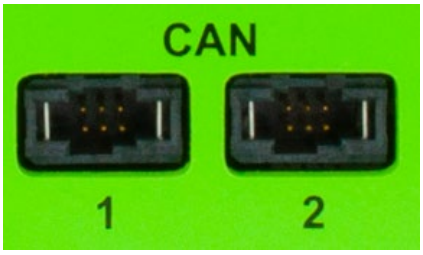


16	Violet	I2C0_SCL (**3.3V Max.**)	I/O
17	Gray	I2C0_SDA (**3.3V Max.**)	I/O
18	White	GND	Power
19	Black	I2C2_SCL (**3.3V Max.**)	I/O
20	Blue	I2C2_SDA (**3.3V Max.**)	I/O
21	Brown	GND	Power
22	Red	GPO12 (**3.3V Max.**)	O
23	Orange	GPO13 (**3.3V Max.**)	O
24	Yellow	GPI14 (**3.3V Max.**)	I
25	Green	GPI17 (**3.3V Max.**)	I
26	Violet	GND	Power
27	Gray	GPO18 (**3.3V Max.**)	O
28	White	GPI19 (**3.3V Max.**)	I
29	Black	GND	Power
30	Blue	RXD+ (RS485)	I
31	Brown	RXD- (RS485)	I
32	Red	TXD+ (RS485)	O
33	Orange	TXD- (RS485)	O
34	Yellow	RTS (RS485)	O
35	Green	+5V	Power
36	Violet	UART1_TX (**3.3V Max.**)	O
37	Gray	UART1_RX (**3.3V Max.**)	I
38	White	+3.3V	Power
39	Black	GND	Power
40	Blue	GND	Power

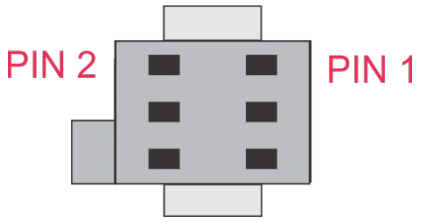
Rudi-AGX Isolated CAN Connector

The Rudi-AGX implements two Samtec TFM-103-02-L-DH-TR Connector to allow for Isolated CAN with built-in 120Ω termination. 1x Isolated Power (+5V), 1x Isolated CANH, 1x Isolated CANL, 3x Isolated Ground.

Function	Description
Location	Front
Type	Isolated CAN Connector
Carrier Connector	TFM-103-02-L-DH-TR
Mating Cable	SFSD-03-28C-G-12.00-SR



Pinout	Colour	Description
1	Brown	GND
2	Red	+5V Isolated
3	Orange	GND
4	Yellow	CANH
5	Green	GND
6	Violet	CANL



Note: Built-in 120Ω termination can by removed with customer request. Please contact Connect Tech Inc. for further details.

Rudi-AGX Reset & Force Recovery Pushbuttons

The Rudi-AGX implements two pushbuttons for Reset and Force Recovery.

Function	Description
Location	Rear

Rudi-AGX Power Connector

The Rudi-AGX implements a Mini-Fit Jr. 4-Pin Power Connector that accepts +9V to +36V DC power.

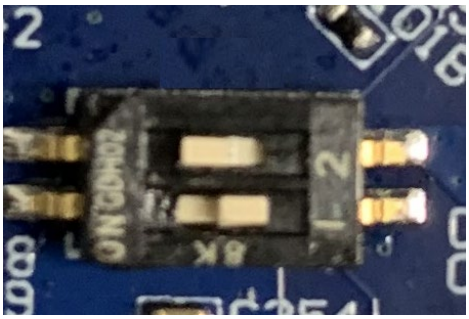
Function	Description
Location	Front
Type	Mini-Fit Jr. 4-Pin Connector
Minimum Input Voltage	+9V DC
Maximum Input Voltage	+36V DC
Mating Cable	CBG408

Note: A Power Supply capable of 120W or more is required to operate the Rudi-AGX with all peripherals running at their respective maximum rating.

Rudi-AGX GMSL 1/2 DIP Switch Selection

The Rudi-AGX internally implements 2 position DIP Switch for the selection of GMSL 1 or GMSL 2.

Function	Description
Location	Embedded within Rudi-AGX
Type	DIP Switch
SW3-1 – OFF **SW3-2 – OFF**	GMSL1 High Immunity Mode - ON
SW3-1 – ON **SW3-2 – OFF**	GMSL2 3 Gbps
SW3-1 – OFF **SW3-2 – ON**	GMSL2 6 Gbps



SW4

LEFT SIDE (ON)	**RIGHT SIDE (OFF)**
SW4-2	SW4-2
SW4-1	SW4-1

Rudi-AGX Antenna Connectors

The Rudi-AGX chassis implements 4x SMA Antenna Connectors (Optional) for the internal M.2 2230 E-Key (WiFi/Bluetooth) and M.2 3042 B-Key (Cellular).

Function	Description
Location	Front and Rear
Type	SMA Connector
Mating Connector	Antenna Connector

TYPICAL INSTALLATION

1. Ensure all external system power supplies are off and disconnected.
2. Install the necessary cables for your application. At a minimum these would include:
    a) Power cable to the input power connector.
    b) Ethernet cable into its port (if applicable).
    c) HDMI video display cable (if applicable).
    d) Keyboard, Mouse, etc. via USB (if applicable).
    e) SD Card (if applicable).
    f) SIM Card (if applicable).
    g) GMSL Camera(s) (if applicable).
    h) GPIO 40-Pin Connector (if applicable).
    i) CAN 6-Pin Connector (if applicable).
    j) Antennas for WiFi/Bluetooth (if applicable).
    k) Antennas for Cellular (if applicable).

3) Connect the Power Cable of the +9V to +36V Power Supply into the Mini-Fit Jr. 4-Pin power connector.
4) Plug the AC cable into the Power Supply and into the wall socket.
   DO NOT power up your system by plugging in live power.

POWER CONSUMPTION & THERMALS

The Rudi-AGX has an Operating Temperature Range of -25°C to +60°C.

However, it is important to note that the NVIDIA® Jetson AGX Xavier™ module has its own properties separate to that of the peripherals.

Customer responsibility requires proper implementation of a thermal solution that maintains the Rudi-AGX temperatures below the specified temperatures (shown in the tables below) under the maximum thermal load and system conditions for their use case.

NVIDIA® Jetson AGX Xavier™

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

Rudi-AGX

Parameter	Value	Units
Maximum Operating Temperature @125CFM No M.2 Peripherals Installed	T.cpu = 90.5	°C
	T.gpu = 93.0	°C
	T.amb = 60.0	°C

Parameter	Value	Units	Value	Units	Temperature
Rudi-AGX Theoretical Maximum	19	V	TBD	W	25°C (typ.)
Rudi-AGX, NVIDIA® Jetson AGX Xavier™ Module Installed, Fully-Booted, Idle, Passive Cooling	19	V	TBD	W	25°C (typ.)
Rudi-AGX, NVIDIA® Jetson AGX Xavier™ Module Installed, Fully-Booted, 100% CPU, 100% GPU, 100% NVMe(s), 125CFM Airflow	19	V	TBD	W	25°C (typ.)

CABLES

Description	Part Number	Qty
Power Input Cable	CBG408	1
GPIO Cable	SFSD-20-28C-G-12.00-SR	1
CAN Cable	SFSD-03-28C-G-12.00-SR	2

ACCESSORIES

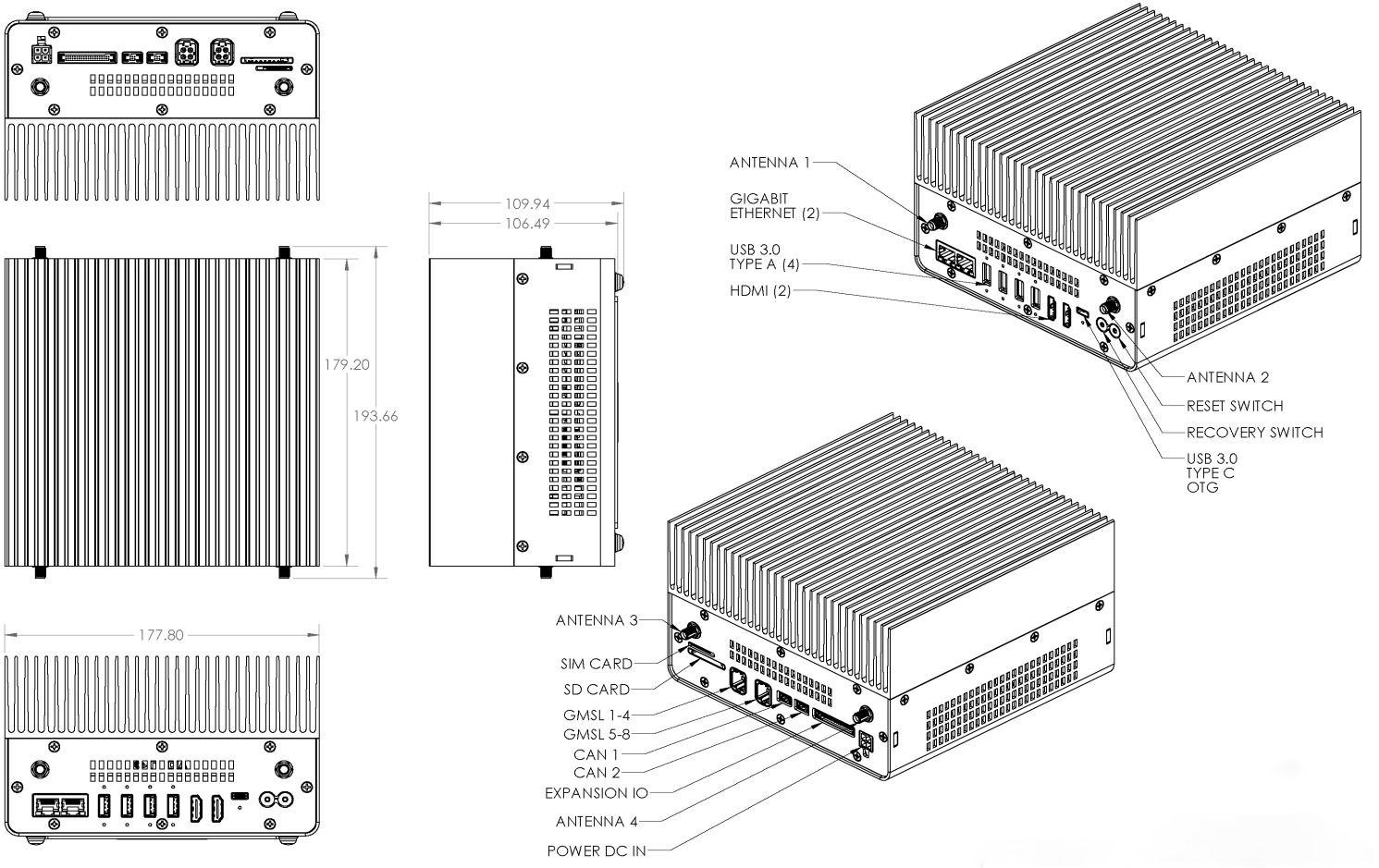
Description	Part Number
AC/DC Power Supply	MSG085
AC/DC Power Supply Input Adapter	CBG315
Quad FAKRA GMSL1/2 Cable	CBG341
WiFi/BT Antenna	MSG093
LTE Antenna	MSG094

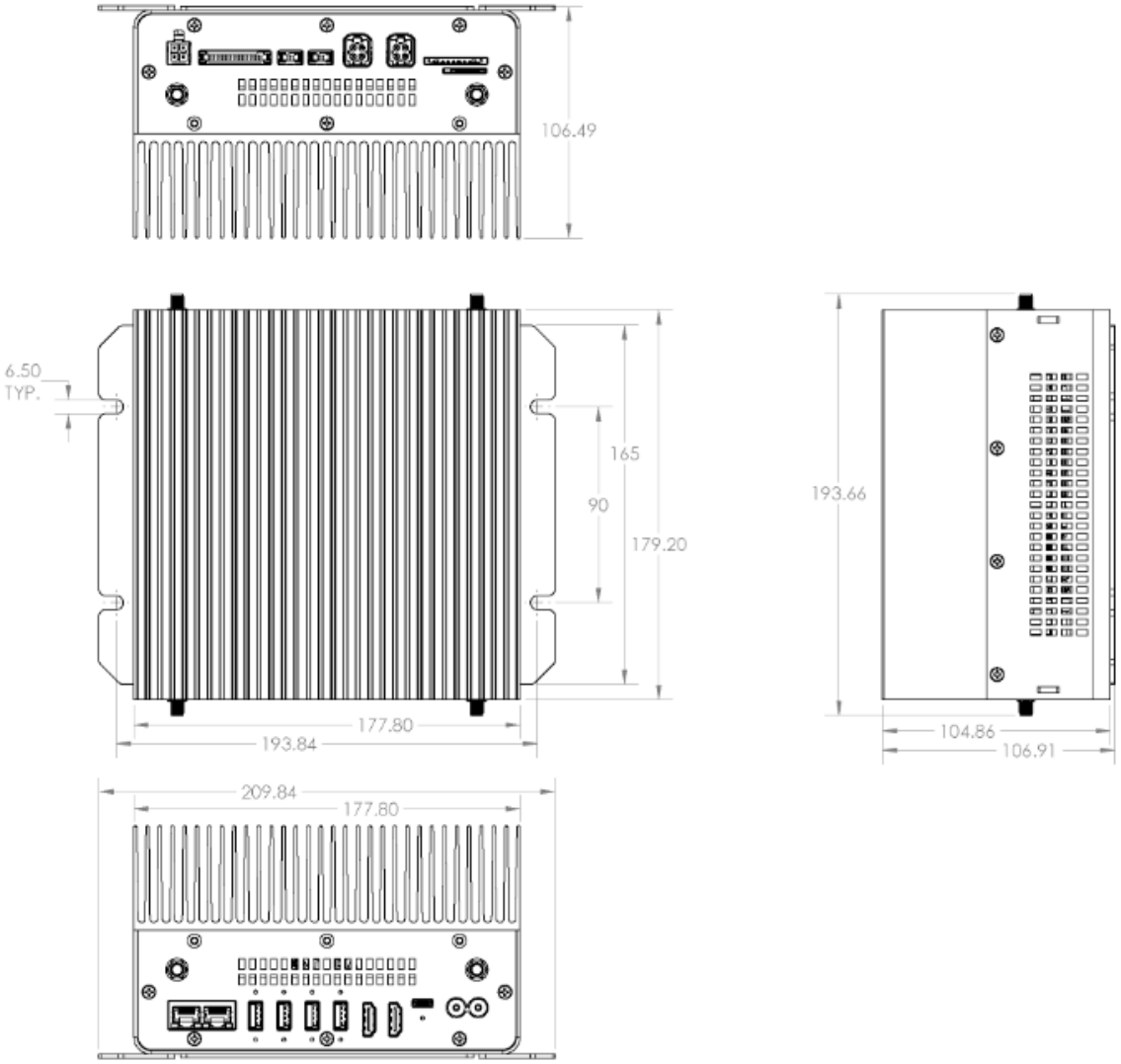
SUPPORTED CAMERAS

Manufacturer	Description	Part Number	Image Sensor
e-con Systems	GMSL1 Camera	NileCAM30	AR0330
Leopard Imaging	GMSL2 Camera	LI-IMX390-GMSL2-060H	IMX390

MECHANICAL DRAWINGS & MODELS

For a complete **3D STEP Model** file of Rudi-AGX, please contact support@connecttech.com.

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179.20
177.80
193.84
193.66
104.86
106.91
209.84
177.80

Assembly/Disassembly Instructions