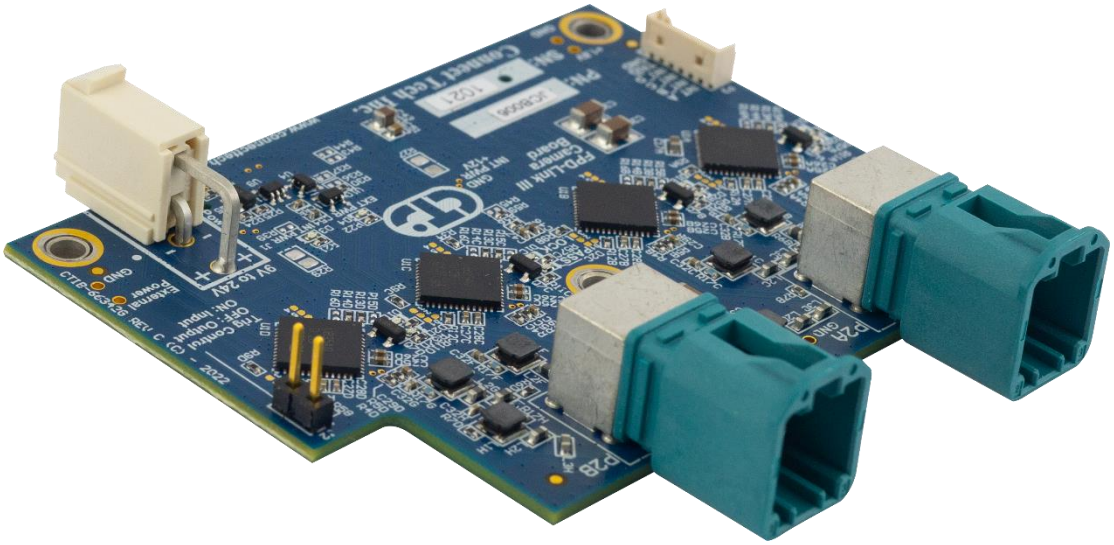
Connect Tech Inc.

Embedded Computing Experts

USERS GUIDE



NVIDIA® Jetson™ FPD-Link III Camera Platform

CTIM-00061 Revision 0.00 2023-02-07

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 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 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	2023-02-07	Preliminary Release

INTRODUCTION

Connect Tech's FPD-Link III camera platform is an expansion board that allows up to 8 cameras to be connected to the NVIDIA® Jetson AGX™ modules. We designed this platform for easy integration with Connect Tech Carriers for the NVIDIA Jetson AGX Xavier™ and AGX Orin™ modules. Power to the cameras is provided by PoC (Power over Coax) so all the data, control signals, and power are sent through a single 50 Ohm Coaxial cable. This allows for flexibility in cable routing and ease of installation in automotive applications.

The main power for the board comes from the Camera Expansion Header. The 12V power for the cameras is also available from the same header on applicable Connect Tech Carriers for Jetson AGX Xavier™ and AGX Orin™. A hot pluggable external +9 to +24V connector is available on the JCB006 for applications where more power to the cameras is required (i.e 4 or more cameras). The circuit will always take the external voltage if both are connected within the valid range of voltage.

Product Features and Specifications

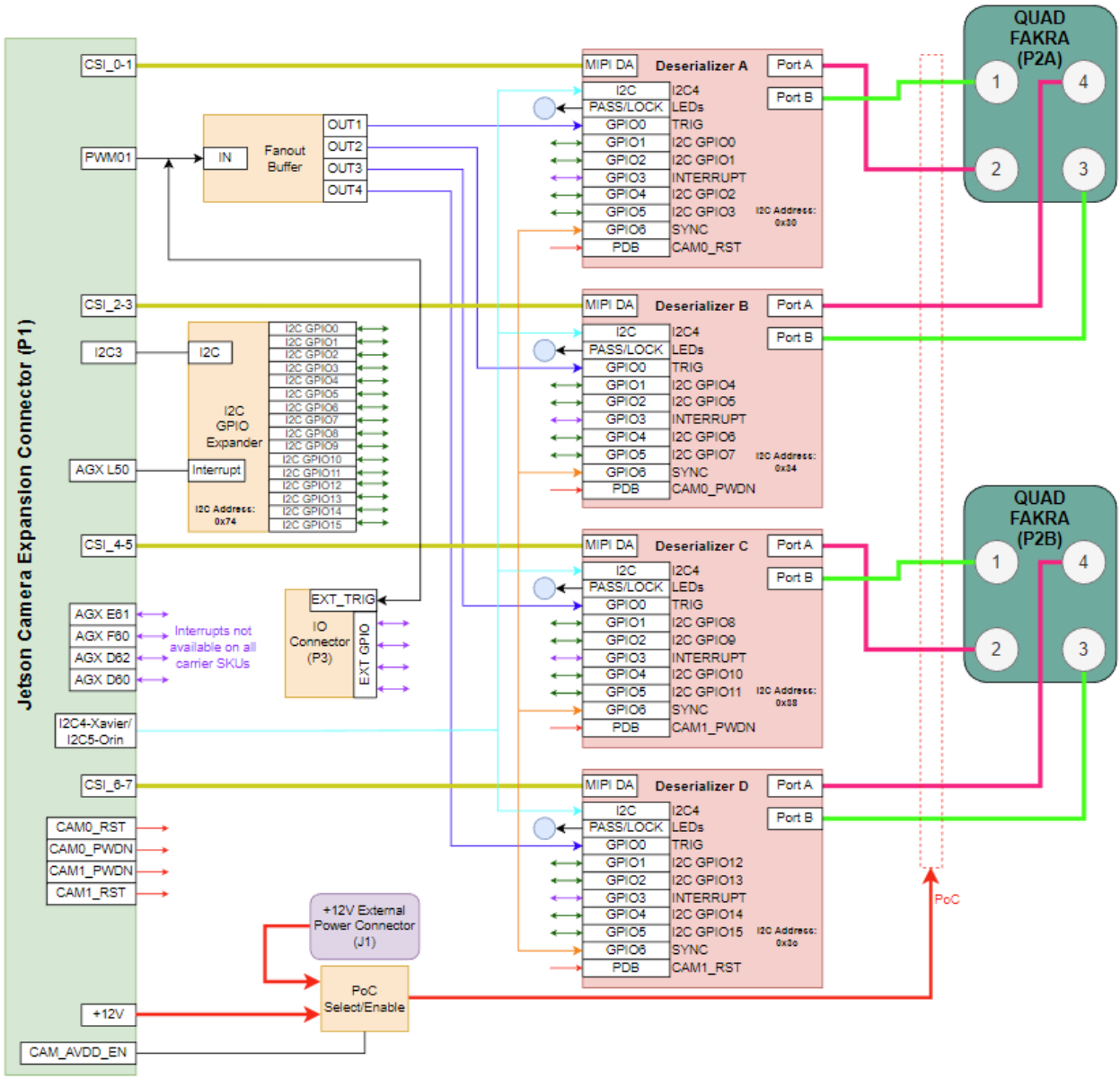
Specifications	
PCB Size	75mm x 57mm
Weight	38g
NVIDIA® Xavier™ Connection (Uplink)	1x High Density Connector Camera Board will mate to the NVIDIA® Jetson™ "Camera Expansion Header"
Camera Inputs (FPDLINK)	8x Total
Deserializer	TI DS90UB954-Q1
MIPI Output	A single 4-lane MIPI CSI-2 v1.3 output from each (4) Deserializer (16-lanes total)
Camera Input Connectors	2x MATE-AX Quad Coax Connectors Breakout cables to FAKRA available
PoC (Power-Over-COAX)	All 8 cameras will be sourced 12V Power-Over-COAX from JCB006
Power	Directly powered from Camera Expansion Header or External +9 to 24V Input
Operating Temperature	-40°C to +85°C
Warranty and Support	1 Year Warranty and Free Technical Support
Mechanical Dimensions	57.00mm x 75mm

Associated Part Number Ordering Information

Part Number	Description
AGX101-XX / AGX111-XX	Rogue Carrier with FPDLINK Camera Platform Integrated – please see https://connecttech.com/product/fpd-link-iii-camera-board-2/ for full listing
AGX103-XX	Rogue-X Carrier with FPDLINK Camera Platform Integrated – please see https://connecttech.com/product/fpd-link-iii-camera-board-2/ for full listing
AGX201-XXX	Forge Carrier with FPDLINK Camera Platform Integrated – please see https://connecttech.com/product/fpd-link-iii-camera-board-2/ for full listing
AGX202-XXX	Rogue for Orin Carrier with FPDLINK Camera Platform Integrated – please see https://connecttech.com/product/fpd-link-iii-camera-board-2/ for full listing
CBG341	Mate-AX to 4x FAKRA cable – 1m cable

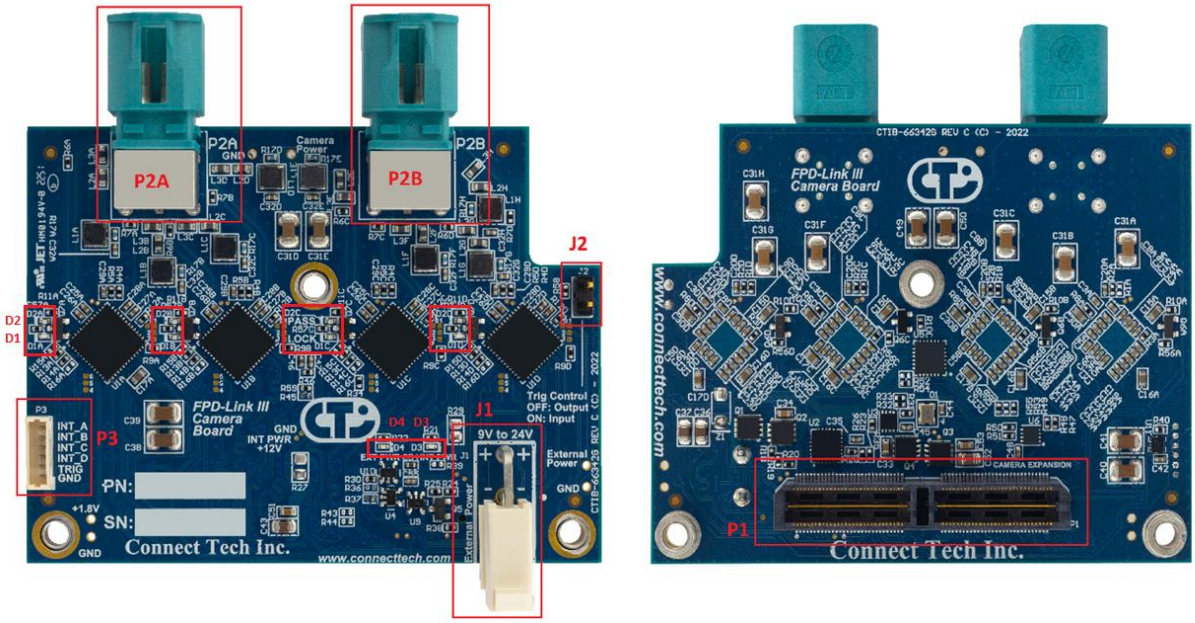
PRODUCT OVERVIEW

Block Diagram



Note: The Power over Coax source is shared, but each port has its own filter which can handle up to 500mA.

Connector Summary & Locations



Connectors

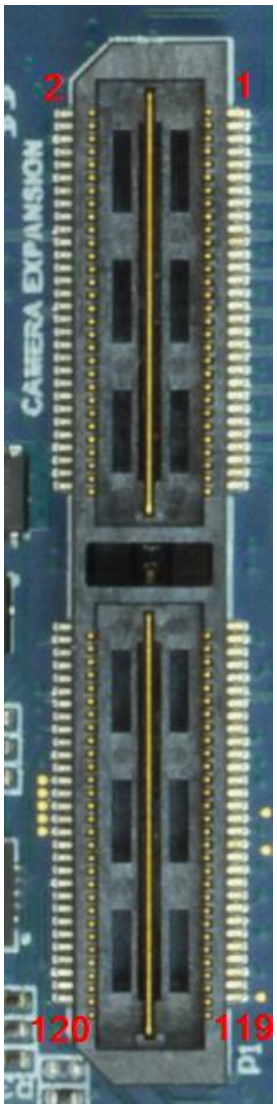
Designator	Connector Description
P1	MIPI Camera Expansion Connector (Samtec QTH)
P2A, P2B	Quad FAKRA Connector (Mate-AX Style, 4-position miniCoax)
P3	IO Connector
J1	External power Connector (Mini-Fit Jr.)
J2	Trigger Control Jumper

LEDs

Designator	Connector Description
D1	D1A, D1B, D1C, D1D are the PASS LED indicator for the corresponding Deserializer
D2	D2A, D2B, D2C, D2D are the LOCK LED indicator for the corresponding Deserializer
D3	Power LED indicator from J1
D4	Power LED indicator from P1

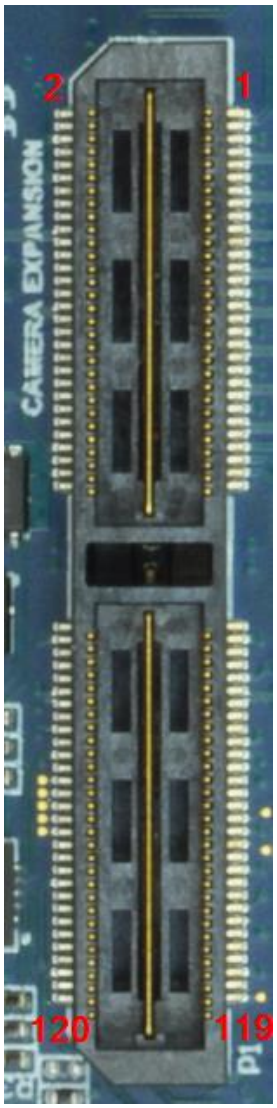
[P1] MIPI Camera Expansion Connector Pinout

Function	8 MIPI CSI-2 Camera Interface		
Pin	Description	Pin	Description
1	CSI0_D0_P	2	CSI1_D0_P
3	CSI0_D0_N	4	CSI1_D0_N
5	GND	6	GND
7	CSI0_CLK_P	8	CSI1_CLK_P
9	CSI0_CLK_N	10	CSI1_CLK_N
11	GND	12	GND
13	CSI0_D1_P	14	CSI1_D1_P
15	CSI0_D1_N	16	CSI1_D1_N
17	GND	18	GND
19	CSI2_D0_P	20	CSI3_D0_P
21	CSI2_D0_N	22	CSI3_D0_N
23	GND	24	GND
25	CSI2_CLK_P	26	CSI3_CLK_P
27	CSI2_CLK_N	28	CSI3_CLK_N
29	GND	30	GND
31	CSI2_D1_P	32	CSI3_D1_P
33	CSI2_D1_N	33	CSI3_D1_N
35	GND	36	GND
37	CSI4_D0_P	38	CSI6_D0_P
39	CSI4_D0_N	40	CSI6_D0_N
41	GND	42	GND
43	CSI4_CLK_P	44	CSI6_CLK_P
45	CSI4_CLK_N	46	CSI6_CLK_N
47	GND	48	GND
49	CSI4_D1_P	50	CSI6_D1_P
51	CSI4_D1_N	52	CSI6_D1_N
53	GND	54	GND
55	**+12V**[1]	56	**+12V**[1]



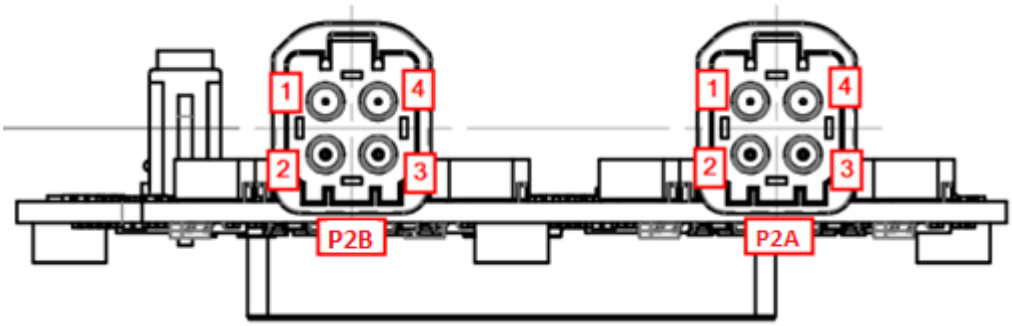
[1] pins 55, 56, 57, 58 are reserved on NVIDIA® Developer Kits. Powering +12V through the connector requires use of a Connect Tech Carrier for Jetson AGX Xavier™ or AGX Orin™.

Pin	Description	Pin	Description
57	+12V[1]	58	+12V[1]
59	CSI5_D0_P	60	CSI7_D0_P
61	CSI5_D0_N	62	CSI7_D0_N
63	GND	64	GND
65	CSI5_CLK_P	66	CSI7_CLK_P
67	CSI5_CLK_N	68	CSI7_CLK_N
69	GND	70	GND
71	CSI5_D1_P	72	CSI7_D1_P
73	CSI5_D1_N	74	CSI7_D1_N
75	I2C3_SCL	76	NC
77	I2C3_SDA	78	PWM01
79	GND	80	GND
81	NC	82	NC
83	NC	84	NC
85	NC	86	GPIO_INT
87	NC	88	NC
89	NC	90	CAM1_PWDN
91	NC	92	CAM1_RST#
93	CAM0_PWDN	94	NC
95	CAM0_RST#	96	NC
97	NC	98	NC
99	GND	100	GND
101	NC	102	+1.8V
103	CAM_INT3[2]	104	CAM_INT4[2]
105	I2C4_SCL	106	CAM_INT2[2]
107	I2C4_SDA	108	+3.3V
109	NC	110	+3.3V
111	NC	112	NC
113	NC	114	NC
115	GND	116	GND
117	CAM_INT1[2]	118	NC
119	CAM_AVDD_EN	120	NC



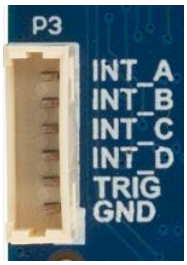
[2] Descriptions in yellow are not available on all Connect Tech Carriers for Jetson AGX Xavier™ or AGX Orin™.

[P2] FPDLINK and Software Development



Note: refer to block diagram for camera port and MIPI lane mapping.

[P3] IO Connector

Pin	Description	Connector
1	GND	PN: 53047-0610 Mate: 15134-06## 
2	External Trigger. Direction programmable via J1 Jumper.	
3	Interrupt GPIO to Deserializer D	
4	Interrupt GPIO to Deserializer C	
5	Interrupt GPIO to Deserializer B	
6	Interrupt GPIO to Deserializer A	

[J1] External Power Connector

Pin	Description	Connector
1 (Bottom)	GND	PN: 87427-0202 Mate: 24513502## 
2 (Top)	+9V to +24V *External Power will always be priority if it is within valid voltage range	

[J2] Trigger Control Jumper

Status	Function
Off	PWM Trigger direction is set to output (software still necessary to enable output signal) PWM Trigger source comes from P1 Pin 78 - PWM01 (From NVIDIA® Jetson AGX Xavier™ or Jetson AGX Orin™ carrier/module)
On	PWM Trigger direction is set to input PWM Trigger source comes from P3 Pin 2

TYPICAL INSTALLATION AND USAGE

Software setup

Prior to hardware installation, make sure you have the correct software installed on the Jetson AGX Xavier™ module. Installation instructions can be found at https://connecttech.com/resource-center/kdb373/. All other FPDLINK cameras should work with proper software and firmware configuration as long as the power requirements match what JCB006 provides.

Hardware setup

1. Ensure all external system power supplies are off.
2. Connect camera(s) to miniCoax connector(s).
    a. Optionally connect an external 12V DC power supply to J1.
    b. The external power connector provides unregulated power to the cameras. Do not exceed camera input voltage.
3. Switch ON the Power Supply. DO NOT power up your system by plugging in live power.

Note: 10mm M3 extension standoffs are recommended to be added to the 18mm standoffs provided with the Rogue carrier for clearance.

GPIO Configuration

GPIO		Source	Function
PoC Enable		P1:Pin 119 - CAM_AVDD_EN	Enables Power over Coaxial
EXT TRIG		P1:Pin86 – PWM01 OR External	Direction selectable (via J2) External Trigger.
Deserializer A	GPIO0	P1:Pin86 – PWM01	Global PWM Trigger
	GPIO1	I2C Expander:Pin1 – P00	GPIO
	GPIO2	I2C Expander:Pin2 – P01	GPIO
	GPIO3	P3:Pin6 OR P1:Pin117	Interrupt pin
	GPIO4	I2C Expander:Pin3 – P02	GPIO
	GPIO5	I2C Expander:Pin4 – P03	GPIO
	GPIO6	Deserializer B/C/D GPIO6	Master/Slave synchronization
	PDB	P1:Pin 95 – CAM0_RST#	Deserializer Power ON
Deserializer B	GPIO0	P1:Pin86 – PWM01	Global PWM Trigger
	GPIO1	I2C Expander:Pin5 – P04	GPIO
	GPIO2	I2C Expander:Pin6 – P05	GPIO
	GPIO3	P3:Pin5 OR P1:Pin106	Interrupt pin
	GPIO4	I2C Expander:Pin7 – P06	GPIO
	GPIO5	I2C Expander:Pin8 – P07	GPIO
	GPIO6	Deserializer B/C/D GPIO6	Master/Slave synchronization
	PDB	P1:Pin 95 – CAM0_PWDN	Deserializer Power ON
Deserializer C	GPIO0	P1:Pin86 – PWM01	Global PWM Trigger
	GPIO1	I2C Expander:Pin10 – P10	GPIO
	GPIO2	I2C Expander:Pin11 – P11	GPIO
	GPIO3	P3:Pin4 OR P1:Pin103	Interrupt pin
	GPIO4	I2C Expander:Pin12 – P12	GPIO
	GPIO5	I2C Expander:Pin13 – P13	GPIO
	GPIO6	Deserializer B/C/D GPIO6	Master/Slave synchronization
	PDB	P1:Pin 95 – CAM1_PWDN	Deserializer Power ON
Deserializer D	GPIO0	P1:Pin86 – PWM01	Global PWM Trigger
	GPIO1	I2C Expander:Pin14 – P14	GPIO
	GPIO2	I2C Expander:Pin15 – P15	GPIO
	GPIO3	P3:Pin3 OR P1:Pin104	Interrupt pin
	GPIO4	I2C Expander:Pin16 – P16	GPIO
	GPIO5	I2C Expander:Pin17 – P17	GPIO
	GPIO6	Deserializer B/C/D GPIO6	Master/Slave synchronization
	PDB	P1:Pin 95 – CAM1_RST#	Deserializer Power ON

POWER & THERMALS

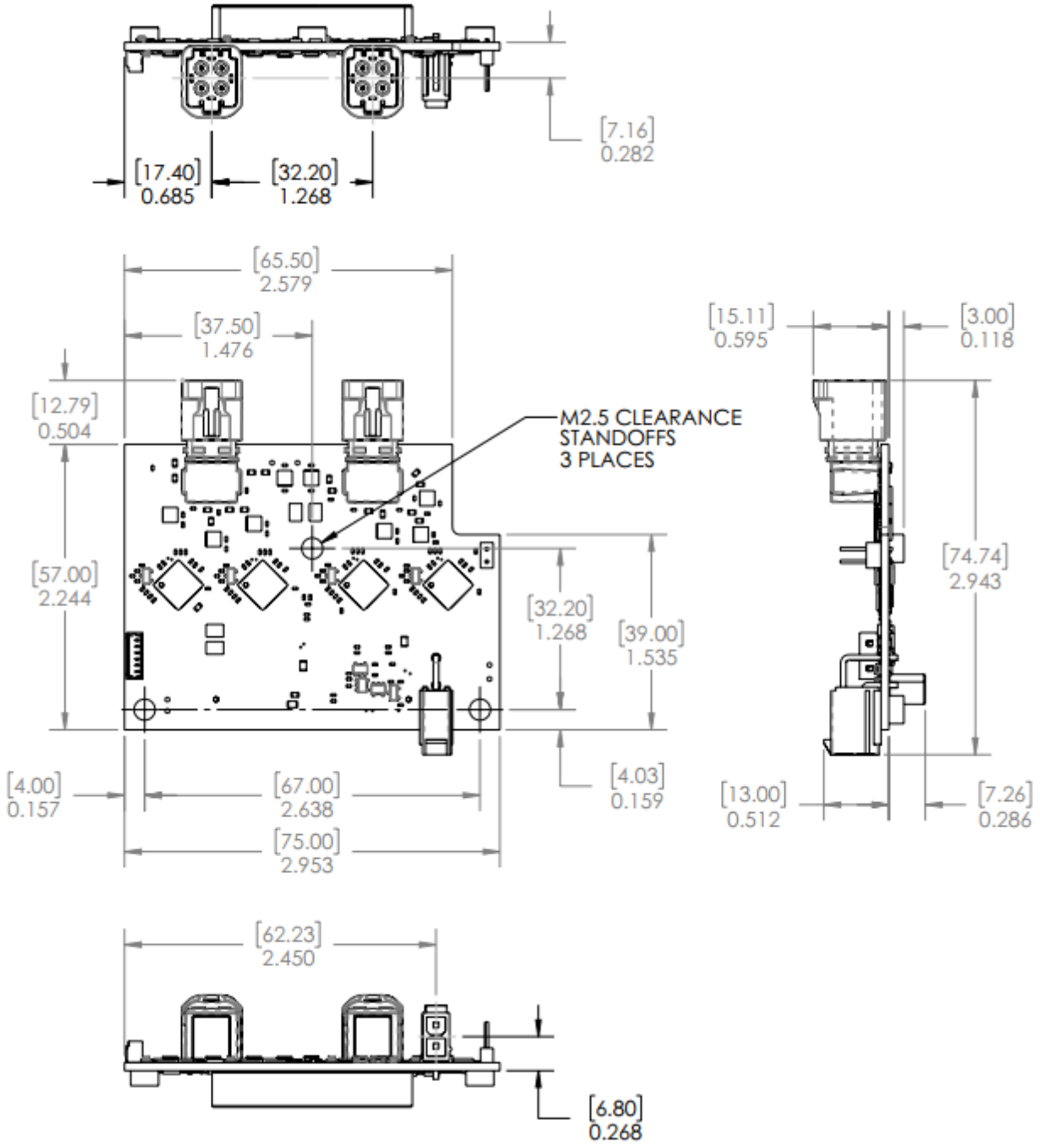
External Power Connector

Although +12V is available on our Connect Tech Carriers for Jetson AGX Xavier™ or AGX Orin™, the JCB006 allows for external power to be provided to the cameras. The voltage is unregulated and allows for +9 to +24V instead of only +12V, so it could potentially damage cameras if they cannot handle the input voltage.

Current Consumption

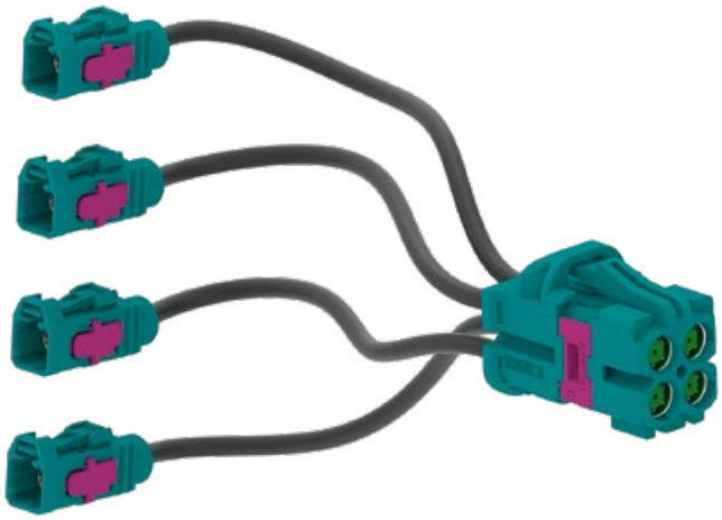
TBD

MECHANICAL DRAWINGS & MODELS



CABLES

CBG341 – 4pos. Mate-AX to 4x FAKRA Z-code 50Ω Cable – 1m length



VERIFIED CAMERAS

FPDLINK compliant cameras can be used with this platform, however please refer to Connect Tech's Support Cameras page.

https://connecttech.com/supported-cameras/