



Connect Tech Inc.
Embedded Computing Experts

USERS GUIDE



Quark Carrier

CTIM-00084(0.05) 2021-11-17



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: <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	2020-02-19	Preliminary Release
0.01	2020-02-27	Cable details added
0.02	2020-06-15	Orderable part numbers added CAN Bus <ul style="list-style-type: none"> • Product feature description updated • I/O Header notes updated USB Type C <ul style="list-style-type: none"> • Power capability note added Supported camera list removed Weight details added CTI thermal solutions for Xavier NX added Mechanical Drawings added Feature Table - GPIO / PWM description updated
0.03	2020-07-13	Product Feature and Specification: <ul style="list-style-type: none"> • Added RTC Battery Support
0.04	2020-12-15	Updated Template Updated Current Consumption Details Updated Typical Installation instructions

0.05	2021-11-17	Updated Company Address
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INTRODUCTION

Connect Tech’s Quark platform brings a low cost deployable Jetson solution to the market. The Quark’s design includes 2x Gigabit Ethernet, 1 x USB 3.1 (Gen 2) Type C with OTG support, 2 x MIPI CSI-2, Camera I2C Control, 6x GPIOs, 2x PWM, 3x UART, 1x CAN, 2x I2C, 1x SPI.

Product Feature and Specifications

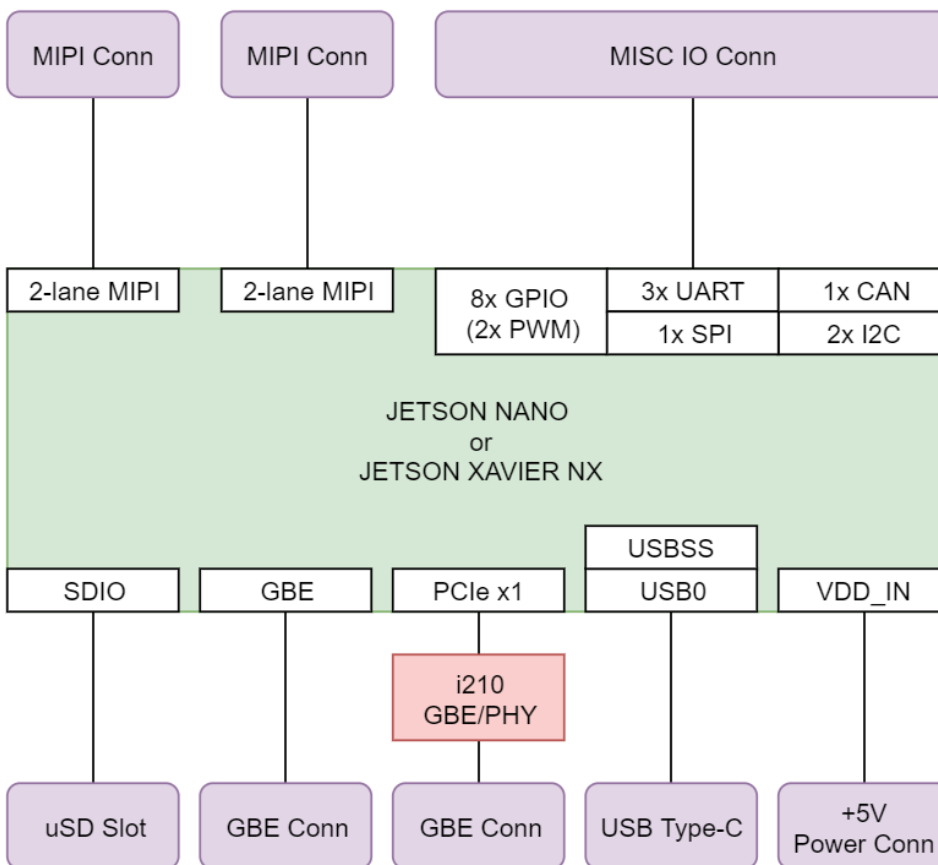
Feature	Description
Module Compatibility	NVIDIA® Jetson Nano™ (PRODUCTION MODULE ONLY) NVIDIA® Jetson Xavier™ NX NVIDIA® Jetson TX2™ NX
Mechanical Dimensions	82.6mm x 58.8mm (3.25" x 2.31")
USB Camera	1x USB 3.1 Gen 2 (Connector: USB Type-C)
MIPI Cameras	2x 2-lane MIPI CSI-2 Connector: 1-1734248-5 <ul style="list-style-type: none"> • 15-pin FPC 1mm Pitch Connector • Same MIPI connector used on Nano Dev Kit
Camera Control Interface	1x I2C (Can be used for Lens Control)
Internal Debug Ports	1x UART for Debug (I/O header)
Storage	1x SD Card Slot
IO – Ethernet	2x 10/100/1000BASE-T Uplink
IO – USB OTG	1x USB 2.0 OTG for Flashing Capability (Type C)
IO – UART Debug	1x Debug UART (I/O header)
IO – UART	2x UART (I/O header)
IO – CAN	1x CAN bus (I/O header) – Supported by Jetson Xavier™ NX only
IO – I2C	2x I2C bus (I/O header)
IO – SPI	1x SPI bus (I/O header)
IO – GPIO / PWM	8x GPIO (I/O header) – 1x PWM Capable
Power – RTC Battery	3-Pin RTC Battery Connector (Rev C and onwards)
Operating Temperature	-25°C to +85°C (-13°F to +185°F)
Weight	33 Grams (1.16oz)
Warranty and Support	1 Year Warranty and Free Support

Part Numbers / Ordering Information

Part Number	Description
NGX004	Quark Carrier Only
NGX004-01	Quark Carrier + NVIDIA® Jetson Nano™ Module + Thermal Transfer Plate
NGX004-02	Quark Carrier + NVIDIA® Jetson Nano™ Module + Active Thermal
NGX004-03	Quark Carrier + NVIDIA® Jetson Nano™ Module + Passive Thermal
NGX004-04	Quark Carrier + NVIDIA® Jetson Xavier™ NX Module + Thermal Transfer Plate
NGX004-05	Quark Carrier + NVIDIA® Jetson Xavier™ NX Module + Active Thermal
NGX004-06	Quark Carrier + NVIDIA® Jetson Xavier™ NX Module + Passive Thermal

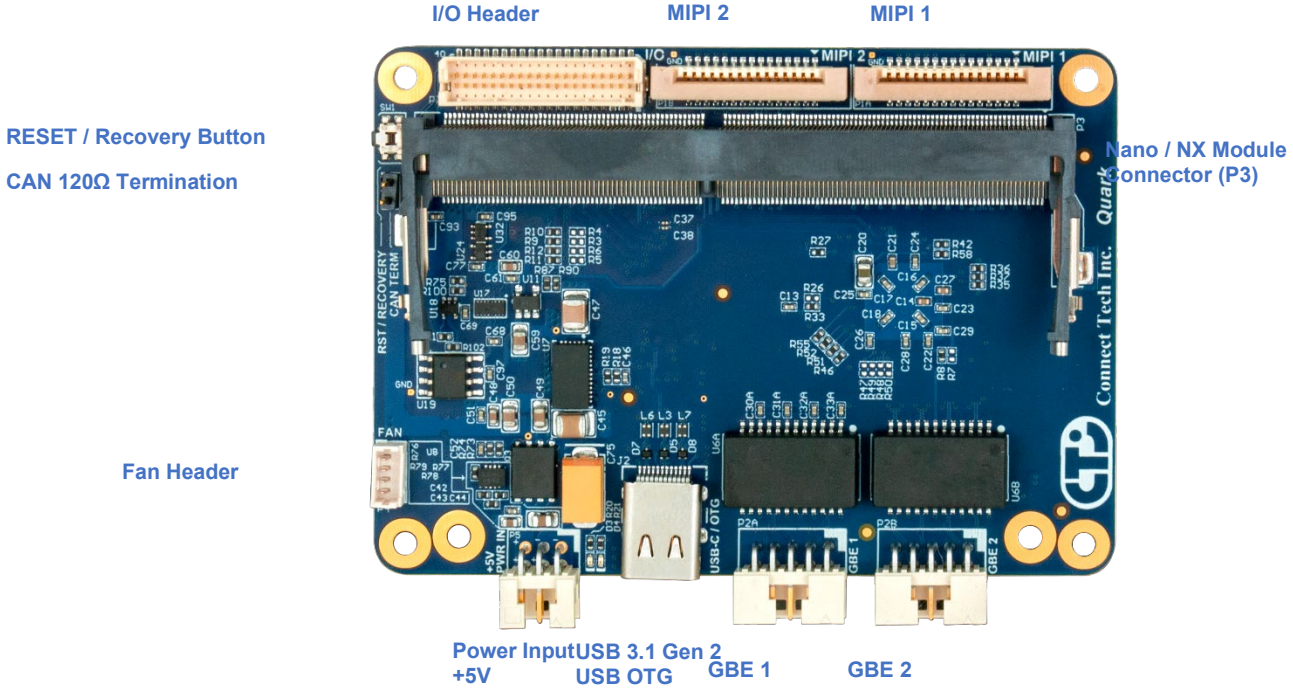
PRODUCT OVERVIEW

Block Diagram

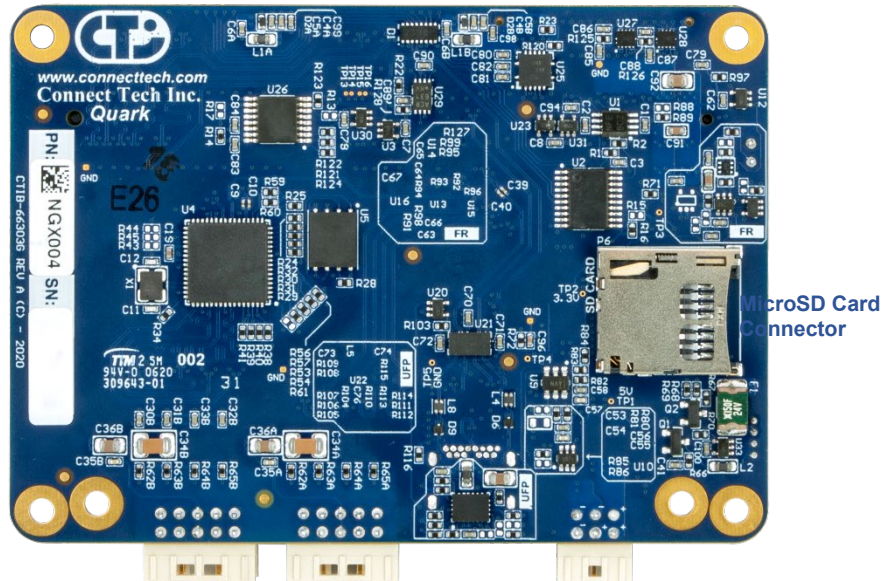


Connector Locations

Top View



Bottom View



Connector Summary

Designator	Connector	Description
P1A	52610-1572	MIPI CSI-2 Camera Connector
P1B	52610-1572	MIPI CSI-2 Camera Connector
P2A	98464-G61-10LF	GBE1 - Jetson onboard ethernet
P2B	98464-G61-10LF	GBE2 – I210 ethernet
P3	2309413-1	Module Board-To-Board Connector for: <ul style="list-style-type: none"> • NVIDIA® Jetson Nano™ • NVIDIA® Jetson Xavier™ NX
P4	53047-0410	Jetson Fan header
P5	98464-G61-06LF	Power header (5V typical)
P6	5025700893	MicroSD Card Connector
P7	DF20G-40DP-1V(56)	I/O header
P8	53047-0310	3-pin RTC battery connector
J1	951102-8622-AR	CAN termination header
J2	632723300011	USB 3.1 Gen 2 (with OTG support)

Switch Summary

Designator	Connector	Description
SW1	EVQ-P7A01P	Dual Function Reset/Recovery Pushbutton

DETAILED FEATURE DESCRIPTION

Jetson Nano™ / Xavier™ NX Module Connector

Description

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

Function	Description
Location	P3
Type	TE Connectivity DDR4 SODIMM 260 Pin
Carrier Connector	Part Number: 2309413-1 Manufacturer: TE Connectivity
Mating Connector	Jetson Nano/Jetson Xavier NX Module
Pinout	Refer to NVIDIA's Jetson Nano or Jetson Xavier NX System-On-Module datasheet for pinout details https://developer.nvidia.com/embedded/downloads
Board-to-Module Standoff Height	M2.5 x 6.57mm standoffs required between NVIDIA Jetson Nano or NVIDIA Jetson Xavier NX Module and Quark Carrier



MIPI CSI-2 Connectors

Description

The NVIDIA® Jetson Nano™ / NVIDIA® Jetson Xavier™ NX module will allow 2-Lane MIPI video input via the vertical FPC connectors.

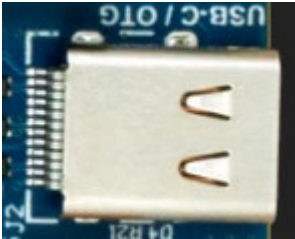
Function	Description
Location	P1A, P1B
MIPI Lane usage	P1A – CSI0 P1B – CSI2
Type	MOLEX FPC Vertical Connector 15 Pin
Carrier Connector	Part Number: 0526101572 Manufacturer: MOLEX
Pinout	
Pin 1	GND
Pin 2	CAM_DN0
Pin 3	CAM_DP0
Pin 4	GND
Pin 5	CAM_DN1
Pin 6	CAM_DP1
Pin 7	GND
Pin 8	CAM_CLKN
Pin 9	CAM_CLKP
Pin 10	GND
Pin 11	CAM_PWDN
Pin 12	CAM_MCLK
Pin 13	I2CO_SCL
Pin 14	I2CO_SDA
Pin 15	3.3V



USB 3.0 Type-C Connector

Description

The NVIDIA® Jetson Nano™ / NVIDIA® Jetson Xavier™ NX module will allow video input via the USB 3.0 Type-C connector.

Function	Description	
Location	J2	
Type	Würth Electronics USB3.1 Type-C Connector	
Carrier Connector	Part Number: 632723300011 Manufacturer: Würth Electronics	
Mating Connector	USB Type-C Cable	
Pinout	Refer to USB3.1 Type-C Pinout	

Note 1: This port can also be used for host mode access to The Quark module at 5Gbps only.

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

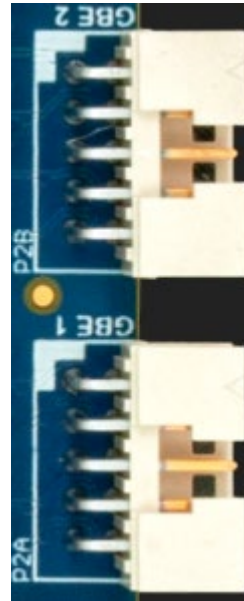
Note 3: J2 can output maximum 2A. For higher current capability, please contact [Sales](#)

10/100/1000 Ethernet Connectors

Description

The NVIDIA® Jetson Nano™ / NVIDIA® Jetson Xavier™ NX module will allow internet communication via GBE connectors as below.

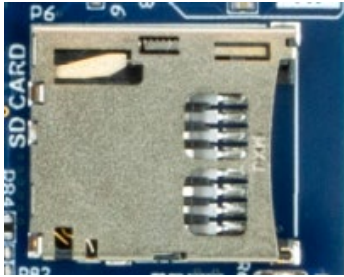
Function	Description
Location	P2A, P2B
Ethernet Usage	P2A – Jetson Onboard Ethernet P2B – I210 Ethernet
Type	10 pin RA connector
Carrier Connector	Part Number: 98464-G61-10LF Manufacturer: Amphenol ICC
Mating Connector	90311-010LF
Mating CTI Cable	CBG117
Pinout	
Pin 1	MDI0_N
Pin 2	MDI0_P
Pin 3	MDI1_N
Pin 4	MDI1_P
Pin 5	GBE_GND (Shield)
Pin 6	GBE_GND (Shield)
Pin 7	MDI2_N
Pin 8	MDI2_P
Pin 9	MDI3_N
Pin 10	MDI3_P



MicroSD Card Connector

Description


The Quark Carrier implements a MicroSD via P11 on bottom side of the carrier.

Function	Description	
Location	P6	
Type	Molex microSD Card Connector	
Carrier Connector	Part Number: 1042391430 Manufacturer: Molex	
Pinout	Refer to SD Card Standard	

+5V Fan Connector

Description

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


Function	Description	
Location	P4	
Type	Molex 4 Position 1.25mm PicoBlade Connector	
Carrier Connector	Part Number: 53047-0410 Manufacturer: Molex	
Mating Connector	Molex 0510210400 PicoBlade Connector	
Pinout		
Pin 1	GND	
Pin 2	+5V	
Pin 3	FAN_TACH	
Pin 4	FAN_PWM	

3-Pin RTC Battery Connector

Description

The Quark Carrier implements a 3 Position Molex PicoBlade connector for connecting RTC battery. This is available from Quark Rev C and onwards.

Function	Description
Location	P8
Type	Molex 3 Position 1.25mm PicoBlade Connector
Carrier Connector	Part Number: 53047-0310 Manufacturer: Molex
Mating Connector	Molex 0510210300 PicoBlade Connector
Pinout	
Pin 1	RTC Battery Positive (+ve)
Pin 2	Not Connect
Pin 3	RTC Battery Negative (-ve)

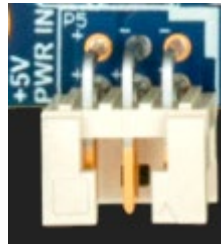


Power Header

Description

The Quark Carrier implements a Power Connector using 98464-G61-06LF from Amphenol FCI.

Function	Description
Location	P5
Type	Amphenol FCI MiniTek Series Connector
Carrier Connector	98464-G61-06LF
Mating Connector	90311-006LF
Mating CTI Cable	CBG112
Pinout	
Pin 1	GND
Pin 2	GND
Pin 3	GND
Pin 4	+5V
Pin 5	+5V
Pin 6	+5V

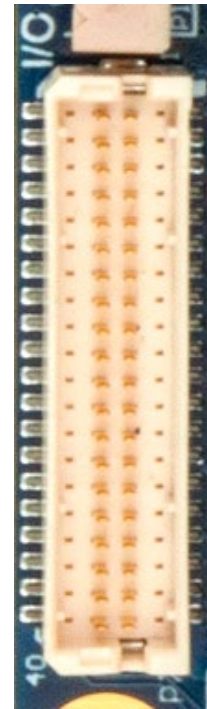


I/O Header

Description

The Quark Carrier implements a DF20G-40DP-1V(56) Connector to allow access for additional GPIO and interfaces.

Function		Description			
Location		P7			
Type		Hirose 40Pin Connector, 1mm Pitch			
Carrier Connector		Part Number: DF20G-40DP-1V(56) Manufacturer: Hirose			
Mating Connector		DF20A-40DS-1C Connector			
Mating CTI Cable		CBG125			
Pinout					
Description	Signal Name	Pins		Signal Name	Description
Signal Ground	GND	1	2	GND	Signal Ground
+3.3V Power Out	+3.3V	3	4	UART0_RX	UART0 Receive
+3.3V Power Out	+3.3V	5	6	UART0_TX	UART0 transmit
I2C0 Clock	I2C0_SCL	7	8	GND	Signal Ground
I2C0 Serial Data	I2C0_SDA	9	10	UART1_TX	UART1 Transmit
I2C1 Clock	I2C1_SCL	11	12	UART1_RX	UART1 Receive
I2C1 Serial Data	I2C1_SDA	13	14	GND	Signal Ground
Signal Ground	GND	15	16	SPI0_SCK	SPI0 Clock
CAN High	CAN_H	17	18	SPI0_MISO	SPI0 Receive
CAN Low	CAN_L	19	20	SPI0_MOSI	SPI0 Transmit
Signal Ground	GND	21	22	SPI0_CS0	SPI0 Chip Select
Force Recovery	FORCE RECOVERY	23	24	GND	Signal Ground
System RESET	RESET	25	26	GPIO_01	GPIO1
Signal Ground	GND	27	28	GPIO_02	GPIO2
Debug UART Transmit	UART2_TX	29	30	GPIO_03	GPIO3
Debug UART Receive	UART2_RX	31	32	GPIO_04	GPIO4
Signal Ground	GND	33	34	GPIO_05	GPIO5
Signal Ground	GND	35	36	GPIO_06	GPIO6
+5V Power Out	+5V	37	38	GPIO_07	PWM1 / GPIO7
+5V Power Out	+5V	39	40	GPIO_08	GPIO8



Notes:


- +3.3V and +5V power pins are outputs only, **DO NOT** feed power to these pins
- CAN bus supported by Jetson Xavier™ NX only
- Different pinout options are available. Please contact CTI for customization.

Reset & Recovery Pushbutton

Description

The Quark Carrier 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	SW1
Type	Panasonic EVQP7 Pushbutton
Carrier Connector	Part Number: EVQ-P7A01P Manufacturer: Panasonic
Reset Button Press	Minimum 250ms (typ.)
Recovery Button Press	Minimum 10s (typ.)



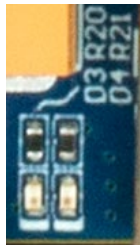
Note: A full power cycle of the system must be performed after module flashing.

LED Indicators

Description

The Quark Carrier implements an LED (D4) for power status indication as follows:

Function	Description
Location	D4
Type	Green LED
Carrier Connector	Part Number: APHHS1005CGCK Manufacturer: Kingbright
Function	LED
Power LED	D4



TYPICAL INSTALLATION

1. Ensure all external system power supplies are off and disconnected.
2. Install the NVIDIA® Jetson Nano™ / NVIDIA® Jetson Xavier™ NX Module into the DDR4 260 Pin SODIMM Connector (P1).
Be sure to follow the manufacturer's directions for proper installation of mounting hardware, heatsink / heat-spreader, and any other applicable requirements from the manufacturer.
3. Install the necessary cables for your application. At a minimum these would include:
 1. Power cable to the input power connector
 2. Connect a 3.3V TTL FTDI Serial cable to UART2 pins on Pin 29 and Pin 31 of the I/O Header (P7)
 3. Keyboard and Mouse via USB (a hub may be required for multiple devices)
 4. MIPI Camera(s)
 5. Using CBG117, connect the system to network
4. Connect the Power Cable of the +5V Power Supply into the Power header (P5)
Plug the AC cable on the +5V Power Supply into the wall. Power issues with the Quark carrier occur for two main reasons: power consumption on boot, and ripple on 5V input. It is important to choose a power supply with a good transient response; otherwise, the Quark carrier will suffer issues in its bootup sequencing. As for power consumption, please refer to our power consumption section in other to aid in your power supply selection.
5. Access the debug UART port using a standard 3.3V TTL FTDI cable to any computer over USB. Another TTL UART interface is required to use the debug port. The default serial settings are 115200 8N1 (standard settings) but hardware flow control has to be turned off.

If using minicom in Linux based systems, serial into the system through disabling the hardware flow control:

1. Press CTRL+A
2. Press o
3. Go to Serial Port Setup
4. Press F (To change hardware flow control to off)
5. (optional) save as default in previous menu

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

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

THERMAL DETAILS

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

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

Customer responsibility requires proper implementation of a thermal solution that maintains The Quark 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 = 102.5	°C
	T.gpu = 103	°C

NVIDIA® Jetson Xavier™ NX

Parameter	Value	Units
Maximum Xavier SOC Operating Temperature	T.cpu = 90.5	°C
	T.gpu = 91.5	°C
Xavier SOC Shutdown Temperature	T.cpu = 96.0	°C
	T.gpu = 95.5	°C

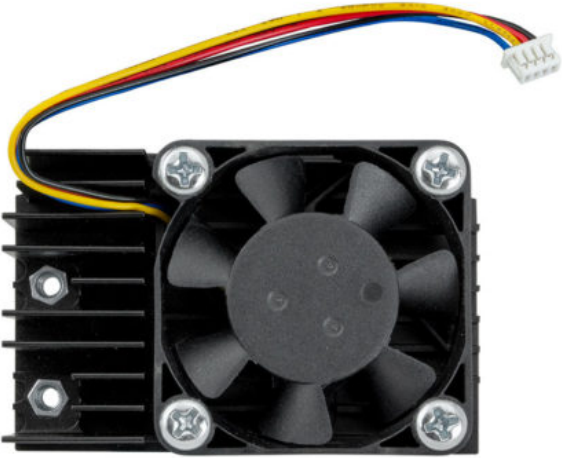


CABLE INFORMATION

Drawing No.	Part No.	Function	Description
CTIC-00431	CBG112	Power Cable	6-pin MiniTek w/ Latch, unterminated
CTIC-00433	CBG117	Ethernet Cable	10-pin MiniTek w/ Latch, RJ-45 Panel Mount
CTIC-00383	CBG125	I/O Cable	DF20A 40 Pin, unterminated




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	XHG312	
Passive Cooling	XHG311	
Thermal Transfer Plate Cooling	XHG313	

CURRENT CONSUMPTION DETAILS

NVIDIA® Jetson Nano™

Parameter	Value	Units	Temperature
NVIDIA® Jetson Nano™ Module, Passive Cooling, Idle, Ethernet, Mouse and Keyboard plugged in	2	W	25°C (typ.)
NVIDIA® Jetson Nano™ Module, Passive Cooling, MAXN mode, CPU-stressed, GPU-stressed, Ethernet, Mouse and Keyboard plugged in	13	W	25°C (typ.)

NVIDIA® Jetson Xavier™ NX

Parameter	Value	Units	Temperature
NVIDIA® Jetson Xavier™ NX Module, Passive Cooling, Idle, Ethernet, Mouse and Keyboard plugged in	3	W	25°C (typ.)
NVIDIA® Jetson Xavier™ NX Module, Passive Cooling, 15W - 6 core mode, CPU-stressed, GPU-stressed, Ethernet, Mouse and Keyboard plugged in	15.5	W	25°C (typ.)

SOFTWARE / BSP DETAILS

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

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

MECHANICAL DETAILS

