



Connect Tech Inc.
Embedded Computing Experts

USERS GUIDE



Spacely Carrier for NVIDIA® Jetson™ TX2/TX2i/TX1

CTIM-00153 Revision 0.19 2020-11-04



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 42 Arrow Road Guelph, Ontario Canada N1K 1S6
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 the Spacely Carrier. 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	2017-03-10	Initial Release
0.01	2017-03-23	Updated Block Diagram
0.02	2017-07-11	Updated image, added cable drawing links
0.03	2017-08-09	Additional Info Added
0.04	2017-08-09	Mechanical Added
0.05	2017-08-10	Software/Switch info added
0.06	2017-08-29	Fan connector info added
0.07	2017-09-29	PSU info added
0.08	2017-12-06	USB and GPIO info edit
0.09	2018-01-11	Revised cable information
0.10	2018-03-08	Added GPIO KDB link
0.11	2018-03-26	Further GPIO info added
0.12	2018-05-16	SIM Info Added
0.13	2018-07-30	Added TX2i compatibility





0.14	2018-11-13	Updated Cables
0.15	2019-04-17	Added TX2i Power Circuitry Note, HDMI 2.0 support
0.16	2019-06-20	Added current consumption
0.17	2019-10-16	Correction to mPCIe pinout, revised connector P/Ns, added standoff note
0.18	2020-10-27	Improved RTC pinout picture
0.19	2020-11-04	Updated format

INTRODUCTION

Connect Tech's Spacely Carrier for NVIDIA® Jetson™ TX2/TX2i/TX1 is an ideal product for unmanned vehicle applications, or any application where situational awareness is critical. Spacely enables users to simultaneously connect up to 6 MIPI CSI-2 cameras as well as offering built-in expansion for a GPS/GNSS module.

This carrier includes a multi-I/O port specifically designed to allow easy connection to OEM Autopilots such as the Pixhawk. Other onboard interconnects include 2x GbE, 1x HDMI, USB 3.0, USB 2.0, USB CLIENT, as well as miniPCIe and mSATA expansion.

Product Features and Specifications

Specifications	
Module Compatibility	NVIDIA® Jetson™ TX2, Jetson™ TX2i and Jetson™ TX1
PCB Size / Overall Size	125mm x 95mm (4.92" x 3.74")
Display	1x HDMI (Supports up to HDMI 2.0 UHD 4K [2160p] at 60Hz)
Camera Inputs	6 x2 Lane MIPI CSI-2or 3 x4 Lane MIPI CSI-2
Ethernet	2x Gigabit Ethernet (10/100/1000)
USB	2x Micro USB 3.0 (Integrated USB 2.0) 2x USB 2.0 1x USB CLIENT 1x USB 2.0 to Mini-PCIe Slot
SATA	1x mSATA Full Size
Audio	HDMI Integrated
Serial	2x 3.3V from Jetson UART0 and UART1
Mini-PCIe	1x Mini-PCIe (PCIe & USB 2.0)
SD Card	1x microSD Card Slot
CAN Bus	1x CAN 2.b Port



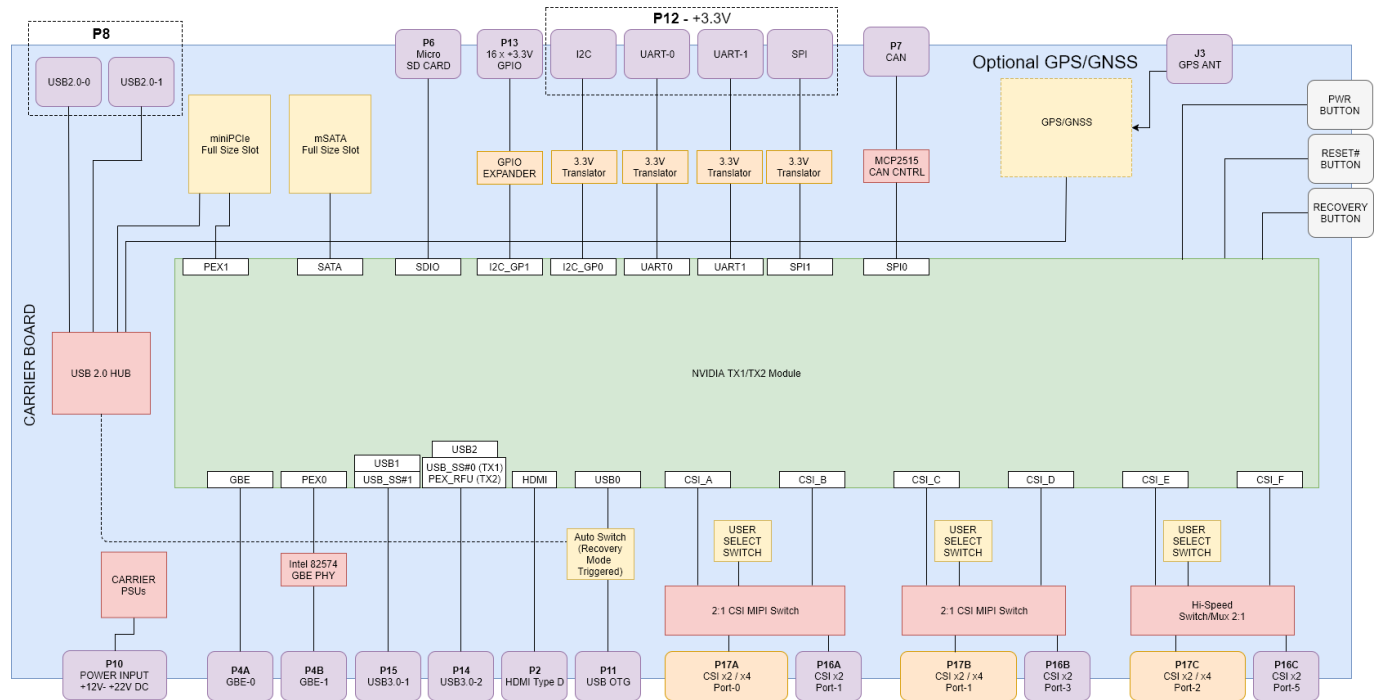
Optional Sensor	1x GPS/GNSS Module (optional)
Misc.	1x I2C Link (+3.3V I/O) 1x SPI Channel (+3.3V I/O) 16x GPIO (3.3V level shifted) System Control
Power Requirements	+12V to +22V DC Input
Operating Temperature	-40°C to +85°C
Weight	90.7grams (0.2lbs)
Accessories	Cable Kit
Warranty and Support	1 Year Warranty and Free Support

Part Numbers / Ordering Information

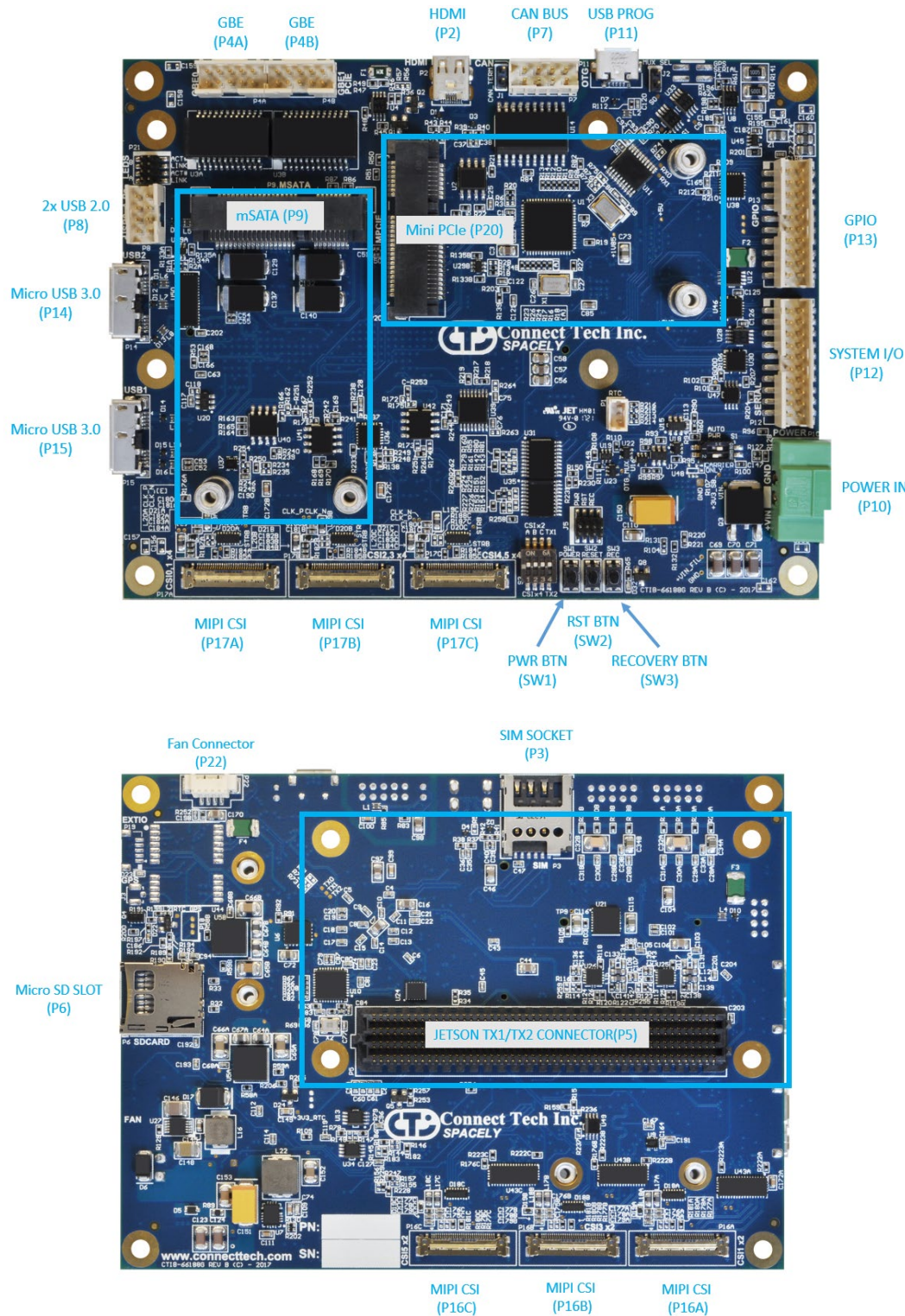
Part Number	
ASG006	Spacely Carrier for NVIDIA® Jetson™ TX2/TX2i/TX1
ASG009	Spacely Carrier for NVIDIA® Jetson™ TX2/TX2i/TX1 with u-blox NEO-M8L GNSS and Sensors

PRODUCT OVERVIEW

Block Diagram



Connector Summary & Locations





Designator	Description
P2	HDMI Right Angle Type D (Micro) Connector
P3	Mini-PCle SIM Card Slot
P4A/B	Ethernet Connector (10/100/1000)
P5	NVIDIA Jetson Module Connector
P6	MicroSD Card Slot
P7	1x CAN Port Connector
P8	2x USB 2.0 Ports
P9	mSATA Full Sized Slot
P10	+12V to +22V DC Power Input
P11	USB 2.0 Link 0 OTG Micro-AB Connector
P12	System I/O including UART and I2C signals
P13	GPIO Connector
P14	Micro USB 3.0 Link 1
P15	Micro USB 3.0 Link 0
P16A/B/C	2 Lane CSI Connector (PEX Micro Coax)
P17A/B/C	2/4 Lane CSI Connector (PEX Micro Coax)
P20	Mini-PCle Full Sized Slot
P22	Fan Connector

DIP Switch and Button Summary & Locations

Designator	Description
SW1	Push button to turn on system
SW2	Push button to reset system
SW3	Push button to place Jetson into force recovery
S1-A	When ON, removes the need to push the power button to turn on the system
S1-B	Used for Factory Test (Leave OFF)
S3-A	Selects 2 or 4 Lane CSI to P17A
S3-B	Selects 2 or 4 Lane CSI to P17B
S3-C	Selects 2 or 4 Lane CSI to P17C
S3-D	TX2/TX2i/TX1 Compatibility mode



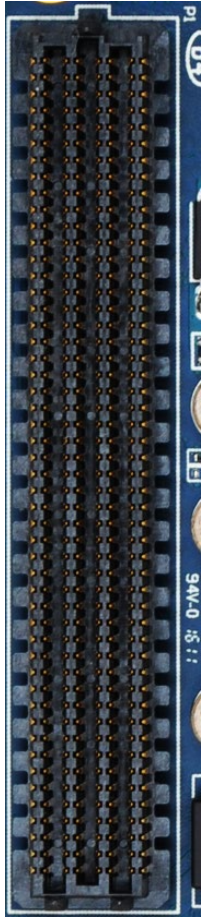
On-Board Indicator LEDs

LED	Description
D32	All Power OK

DETAILED FEATURE DESCRIPTION

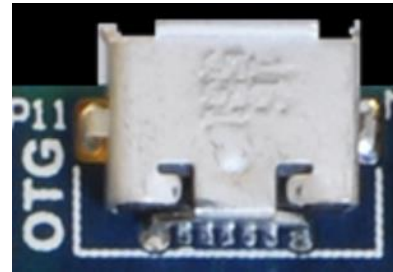
Jetson™ Board-to-Board Connector

With the NVIDIA® Jetson™ the processor and chipset are implemented on the Jetson™ Module. This connects to the Elroy Carrier via a Samtec SEARAY™ Board to Board Connector.

Function	NVIDIA Jetson™ Interface	
Location	P5	
Type	Samtec SEARAY™ Connector	
Carrier Connector P/N	SEAM-50-03.0-S-08-2-A-K-TR (8.0mm stacking height) Manufacturer: Samtec	
Mating Connector P/N	SEAF-50-05-S-08-02-A-K (installed on Jetson™) Manufacturer: Samtec	
Pinout	Refer to NVIDIA's Jetson™ TX2/TX2i/TX1 System-on-Module datasheet for pinout details	
Standoffs	8.0mm Standoffs Required between NVIDIA Jetson Module and Spacely (ASG006/ASG009) Carrier	

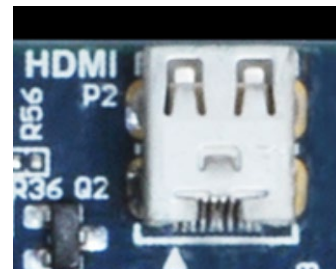
Programming Micro USB 2.0 Connector

Function	Micro USB Connector	
Location	P11	
Type	Micro USB 2.0 Type AB	
Cable	OEM Micro USB cable	
Pinout	Pin	Description
	1	NC
	2	USB_D--
	3	USB_D+
	4	OTG_ID
	5	GND
Note: This port is client-only, and is only active when carrier is in recovery/programming mode		



HDMI Connector

Function	HDMI Connector			
Location	P2			
Type	HDMI Type D			
Cable	OEM HDMI Type D ('micro HDMI') cable			
Pinout	Pin	Description	Pin	Description
	1	Hot Plug Detect	11	TMDS0-
	2	NC	12	TMDS CLK+
	3	TMDS2+	13	GND
	4	GND	14	TMDS CLK-
	5	TMDS2	15	CEC
	6	TMDS1+	16	GND
	7	GND	17	DDC CLK
	8	TMDS1-	18	DDC DATA
	9	TMDS0+	19	+5V
	10	GND		



USB 3.0 Connectors

Function	USB 3.0 Connectivity		
Location	P14, P15		
Type	USB MICRO AB		
Cable	20525-030E-02C		
Pinout	Pin	Description	Type
	1	VBUS	-
	2	USBD-	I/O
	3	USBD+	I/O
	4	NC	-
	5	GND	-
	6	SS0_RX-	Input
	7	SS0_RX+	Input
	8	GND	-
	9	SS0_TX-	Output
	10	SS0_TX+	Output



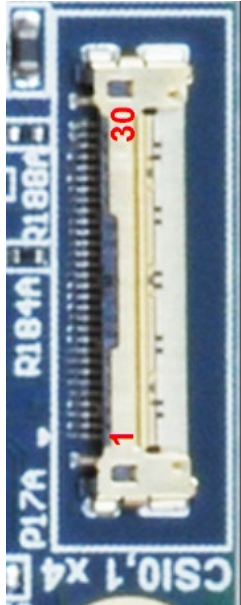
Video Input

NOTE: Please note that MIPI configurations and sideband IO is NOT natively supported by the stock L4T builds. To enable full MIPI functionality users must deploy CTI-L4T BSP. Please see the software section of this document for more details.

CSI x4 / x2 Connectors

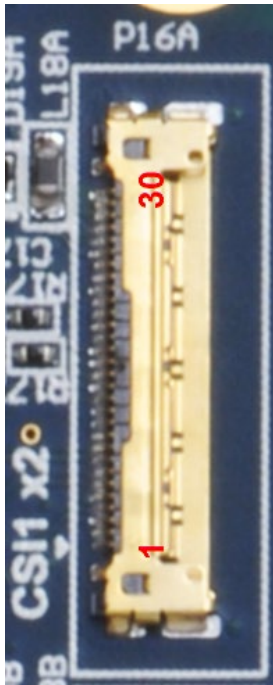
Function	Video Input/Camera			
Location	P17A, P17B, P17C			
Type	IPEX			
Cable	20525-030E-02C			
Pinout	Pin	Description	Pin	Description
	1	+3.3V	16	RST#
	2	+3.3V	17	SDA
	3	+3.3V	18	SCL
	4	+5V	19	NC
	5	NC	20	DATA2-*
	6	NC	21	DATA2+*
	7	NC	22	DATA0-

8	NC	23	DATA0+
9	PWR#	24	CLK-
10	NC	25	CLK+
11	NC	26	GND
12	NC	27	DATA1-
13	NC	28	DATA1+
14	FLASH	29	DATA3-*
15	MCLK	30	DATA3+*
* Pins are NC in x2 mode			



CSI x2 Connectors

Function	Video Input/Camera			
Location	P16A, P16B, P16C			
Type	IPEX			
Cable	20525-030E-02C			
Pinout	Pin	Description	Pin	Description
	1	+3.3V	16	RST#
	2	+3.3V	17	SDA
	3	+3.3V	18	SCL
	4	+5V	19	NC
	5	NC	20	NC
	6	NC	21	NC
	7	NC	22	DATA0-
	8	NC	23	DATA0+
	9	PWR#	24	CLK-
	10	NC	25	CLK+
	11	NC	26	GND
	12	NC	27	DATA1-
	13	NC	28	DATA1+
	14	FLASH	29	NC
	15	MCLK	30	NC




NVIDIA Jetson Fan

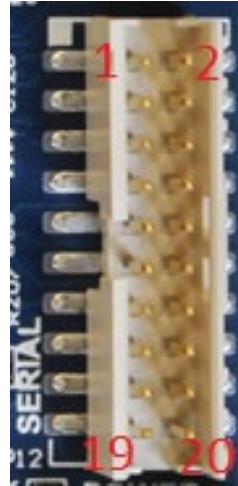
Function	NVIDIA Jetson Fan Control	
Location	P22	
Type	Molex PicoBlade Header	
P/N	53261-0471	
Mating	51021-0400	
Pinout	Pin	Description
	1	GND
	2	+5V
	3	TACH
	4	PWM



NOTE: Please note that FAN PWM (speed control) is NOT natively supported by the stock L4T builds. To enable PWM functionality (speed control) users must deploy CTI-L4T BSP. Please see the software section of this document for more details.

Misc. IO Connector

Function	I/O Connector			
Location	P12			
Type	FCI Minitek Double Row 10 x 2			
P/N	98424-G52-20LF			
Mating	10073599-020LF			
Pinout	Pin	Description	Pin	Description
	1	SPI_CLK	11	I2C_GP0_CLK
	2	UART0_TX	12	UART1_TX
	3	SPI_MOSI	13	I2C_GP0_DAT
	4	UART0_RX	14	UART1_RX
	5	SPI_MISO	15	GND
	6	UART0_RTS#	16	UART1_RTS#
	7	SPI_CS#	17	GPIO_IN
	8	UART0_CTS#	18	UART1_CTS#
	9	GND	19	GND
	10	GND	20	GND



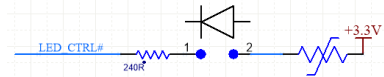
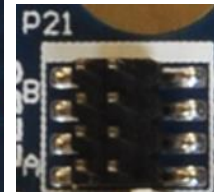
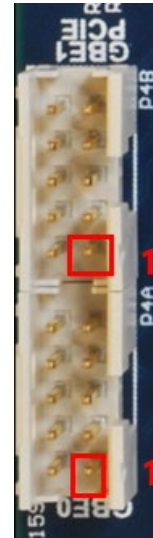

GPIO Connector

Function	GPIO Connector			
Location	P13			
Type	FCI Minitex Double Row 10 x 2			
P/N	98424-G52-20LF			
Mating	10073599-020LF			
Expander PN	TCA9539			
Pinout	Pin	Description	Pin	Description
	1	GPIO-14	11	GPIO-4
	2	GPIO-15	12	GPIO-5
	3	GPIO-12	13	GPIO-2
	4	GPIO-13	14	GPIO-3
	5	GPIO-10	15	GPIO-0
	6	GPIO-11	16	GPIO-1
	7	GPIO-8	17	GND
	8	GPIO-9	18	GND
	9	GPIO-6	19	GND
	10	GPIO-9	20	GND
Please reference our GPIO KDB for TX2/TX2i/TX1 values.				
*Interrupts supported on Revision F and later				



10/100/1000 Ethernet (GBE)

Function	Gigabit Ethernet Connector			
Location	P4A/P4B			
Type	FCI Minitex Double Row 5 x 2			
P/N	98414-G06-10LF			
Mating	10073599-010LF			
Cable	CBG117			
Pinout	Pin	Description	Pin	Description
	1	MX0-	6	SHELL
	2	MX0+	7	MX2-
	3	MX1-	8	MX2+
	4	MX1+	9	MX3-
	5	SHELL	10	MX3+
	ACT#/LINK# LED connection available via header P21:			
	Pin	Description	Pin	Description
	1	GBE1-ACT#	5	GBE0-ACT#(TX1) GBE0-LINK(TX2)
	2	+3.3V	6	+3.3V
	3	GBE1-LINK	7	GBE0-LINK(TX1) GBE0-ACT#(TX2)
	4	+3.3V	8	+3.3V



Isolated CAN

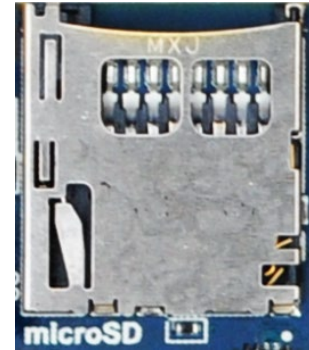
Function	CAN port			
Location	P7			
Type	FCI Minitex Double Row 5 x 2			
P/N	98414-G06-10LF			
Mating	10073599-010LF			
Cable	CBG190/CBG191			
Converter	MPC2515			
Pinout	Pin	Description	Pin	Description
	1	CAN-	6	NC
	2	CAN+	7	CAN-GND



	3	NC	8	CAN-GND
	4	NC	9	CAN-GND
	5	NC	10	CAN-GND

microSD Card Slot

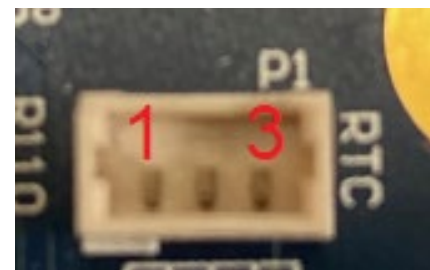
Function	microSD Card Slot			
Location	P6			
Type	Molex microSD Memory Card Connector			
P/N	502570-0893			
Pinout	Pin	Description	Pin	Description
	1	SDIO_DATA2	6	GND
	2	SDIO_DATA3	7	SDIO_DATA0
	3	SDIO_CMD	8	SDIO_DATA1
	4	SDIO_VCC	9	GND
	5	SDIO_CLK	10	SDIO_CD



RTC Battery

The Spacely allows for an external RTC battery to be connected. This battery should be a 3V DC battery, and it will hold settings including date and time. For further information about RTC battery selection and life time estimation, see Application Note 00009: <https://connecttech.com/pdf/CTIN-00009.pdf>

Function	RTC Battery Connector		
Location	P1		
Batt. Voltage	+3V DC		
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





Mini PCI Express / mSATA slots

Function	Mini-PCle/mSATA Slots		
Location	P20, P9		
Type	Lotes Card Edge Connector		
P/N	AAA-PCI-047-K01		
Pinout	Pin	Mini-PCle Description	mSATA Description
	1	WAKE#	-
	2	+3.3V	+3.3V
	3	-	-
	4	GND	GND
	5	-	-
	6	+1.5V	+1.5V
	7	CLKREQ#	-
	8	UIM_PWR*	-
	9	GND	GND
	10	UIM_DATA*	-
	11	PCle CLK-	-
	12	UIM_CLK*	-
	13	PCle CLK+	-
	14	UIM_RESET*	-
	15	GND	GND
	16	UIM_VPP*	-
	17	-	-
	18	GND	GND
	19	-	-
	20	W_DISABLE#	-
	21	CARD_DET (GND)	CARD_DET (GND)
	22	PERST#	-
	23	PCle RX-	SATA TX+
	24	+3.3V	+3.3V
	25	PCle RX+	SATA TX-
	26	GND	GND
	27	GND	GND
	28	+1.5V	+1.5V



*These pins connected directly from Mini-PCle connector to P3 SIM connector.

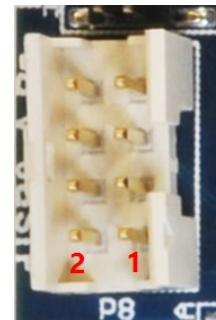




29	GND	GND
30	SMB_CLK	-
31	PCIe TX-	SATA RX-
32	SMB_DATA	-
33	PCIe TX+	SATA RX+
34	GND	GND
35	GND	GND
36	USB D- (P9 Only)	-
37	GND	GND
38	USB D+ (P9 Only)	-
39	+3.3V	+3.3V
40	GND	GND
41	+3.3V	+3.3V
42	-	-
43	DEV_TYPE (GND)	DEV_TYPE (GND)
44	-	-
45	-	-
46	-	-
47	-	-
48	+1.5V	+1.5V
49	-	-
50	GND	GND
51	-	-
52	+3.3V	+3.3V

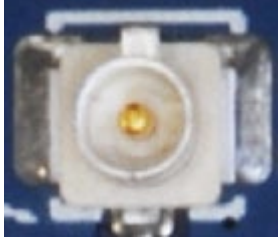
USB 2.0 Ports

Function	USB 2.0			
Locations	P8			
Type	FCI 98414-G06-08LF, 2x4 2mm			
Cable	CBG104			
Pinout	Pin	Description	Pin	Description
	1	Port A-VBUS	5	Port A-D+
	2	Port B-VBUS [1]	6	Port B-D+
	3	Port A-D-	7	Port A-GND
	4	Port B-D-	8	Port B-GND



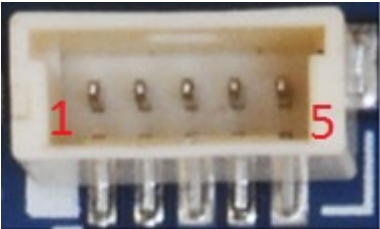
GNSS / GPS INFO (ASG009 ONLY)

Active Antenna Connector

Function	USB 2.0	 U.FL Jack
Function	Active Antenna Connector	
Location	J3	
Connector PN	U.FL-R-SMT-1(01) - Manufacturer: Hirose	
Mating Connector PN	R.FL Socket Standard CTI Cable #: CBG163	

GNSS Misc. IO Connector

Function	IO Connector		
Location	P19		
Type	Molex Pico-Clasp		
P/N	501331-0507		
Mating	501330-0500		
Cable	CBG162		
Pinout	Pin	Signal	Description
	1	EXT_INT / WHEELTICK	External Interrupt Input or Speed pulse input
	2	TIMEPULSE	Time pulse Output
	3	FWD	Forward/Reverse indicator
	4	GND	Digital Ground
	5	NC	



501331-0507

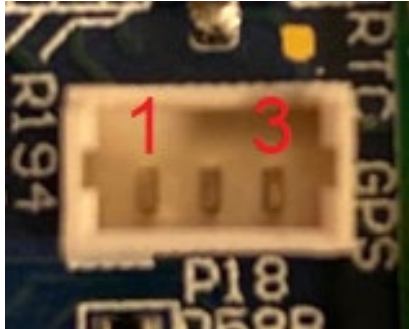
UART Connector

Function	GPS_UART		
Location	J4		
Connector PN	TMM-102-01-L-D-SM		
Pinout	Pin	Signal	Description
	1	GND	Ground
	2	GPS_TXD	Transmit
	3	GND	Ground
	4	GPS_RX	Receive



GPS RTC Battery

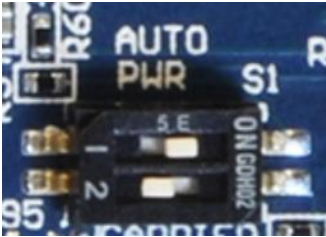
Function	GPS RTC Battery Connector		
Location	P18		
Batt. Voltage	+3V DC		
Connector PN	53047-0310 - Manufacturer: Molex		
Mating PN	51021-0300 - Manufacturer: Molex		
Pinout	Pin	Signal	Description
	1	+3V	RTC Battery Voltage Input
	2	NC	
	3	GND	Ground



JUMPER/SWITCH DESCRIPTIONS

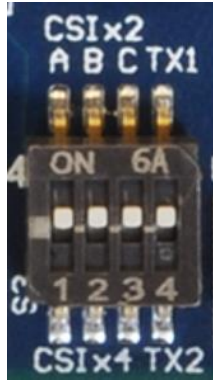
S1 DIP Switch – Carrier Power-On

Function	Auto-On Feature Control			
Location	S1			
Pinout	Switch	Description	ON	OFF
	S1-1	AUTO PWR	Carrier automatically powers on when VIN is applied	Carrier waits for power button press before turning ON
	S1-2	Internal Testing	Leave OFF	
Note: Due to the changes done to the PMIC circuitry of the TX2i Jetson Module the Spacely Carrier will always remain ON when in AT (Automatic Power ON) and ATX (Push Power button) modes. This will cause the Spacely Carrier to automatically power ON when voltage is applied to the system. The system will in addition be unable to shut down in software (Soft Shutdown), due to the characteristics of the TX2i power circuitry as such the system will perform a Reset/Reboot function.				



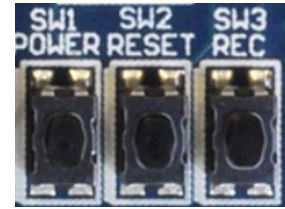
S3 DIP Switch – MIPI Control

Function	MIPI x2/x4 Selection, Jetson USB3.0 Compatibility			
Location	S3			
Pinout	Switch	Description	ON	OFF
	S3-1	CSI 0/1 Switching	CSI-0 x2 CSI-1 x2	CSI-0 x4 CSI-1 NC
	S3-2	CSI 2/3 Switching	CSI-2 x2 CSI-3 x2	CSI-2 x4 CSI-3 NC
	S3-3	CSI 4/5 Switching	CSI-4 x2 CSI-5 x2	CSI-4 x4 CSI-5 NC
	S3-4	P15 USB3.0 MODE	TX1 Compatibility*	TX2 Compatibility*
**Must be used in conjunction with the CTI-L4T release for Spacely.				



SW1-3 Power Control Buttons

Function	Power/Programing Control			
Location	SW1, SW2, SW3			
Pinout	Switch	Description		
	SW1	POWER BUTTON		
	SW2	RESET		
	SW3	RECOVERY		
	Controls Also available via header J5:			
	Pin	Description	Pin	Description
	1	GND	5	GND
	2	PWR_BUT#	6	RECOVERY#
	3	GND	7	NC
	4	RESET#	8	NC



Input Power Connector

Function	Power/Programing Control	
Location	P10	
Type	Pluggable Terminal Contact	
P/N	1843790	
Mating	1847055 (Or equivalent) - included	
Cable	N/A	
Pinout	Pin	Description
	1	+
	2	GND (-)
Input Voltage Range: +12V to +22V DC		



TYPICAL INSTALLATION

1. Ensure all external system power supplies are off.
2. Install the Jetson Module onto the Samtec SEARAY Connector. Be sure to follow the manufacturer's directions for proper installation of mounting hardware, heatsink/heatspreader, and any other applicable requirements from the manufacturer.
3. Install the necessary cables for application. At a minimum these would include:
 - a) Power cable to the input power connector
 - b) HDMI video display cable
 - c) Keyboard and mouse via USB

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

4. Connect the Power Cable to the Power Supply
5. Switch ON the Power Supply. DO NOT power up your system by plugging in live power.

POWER CONSUMPTION & THERMALS

Thermal Details

The Spacely Carrier Board has an Operating Temperature Range of -40°C to +85°C.

However, it is important to note that the NVIDIA Jetson TX2 and TX1 Modules have its own properties separate to that of the Spacely Carrier Board. The NVIDIA Jetson TX2i matches the Spacely Operating Temperature Range of -40°C to +85°C.

Customer responsibility requires proper implementation of a thermal solution that maintains the TX2/TX2i/TX1 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.

Jetson TX2i Thermal Specifications

Parameter	Value	Units
Maximum TTP operating temperature	85	°C
Recommended Tegra X2 operating temperature limit	T.cpu = 95.5	°C
	T.gpu = 95.5	°C
Tegra X2 maximum operating temperature limit	T.cpu = 101	°C
	T.gpu = 101	°C
	T.diode = 110	°C



Jetson TX2/TX1 Thermal Specifications

Parameter	Value	Units
Maximum TTP operating temperature	80	°C
Recommended Tegra X2 operating temperature limit	T.cpu = 95.5	°C
	T.gpu = 93.5	°C
Tegra X2 maximum operating temperature limit	T.cpu = 101	°C
	T.gpu = 101	°C

NVIDIA provides complete Thermal Design Guides, which include all of the information required to implement a complete thermal solution for the Jetson TX2, TX2i or TX1 Module. The Thermal Design Guides can be downloaded here:

Jetson TX2i:

<https://developer.nvidia.com/embedded/dlc/jetson-tx2i-thermal-design-guide>

Jetson TX2/TX1:

<https://developer.nvidia.com/embedded/dlc/jetson-tx2-thermal-design-guide>

Current Consumption Details

Below are the maximum ratings of the Spacely Carrier.

Theoretical Maximum	Watts
Theoretical absolute maximum total draw of all functionality on the Spacely Carrier	TBD

Please refer to the NVIDIA Jetson TX2/TX2i/TX1 manual for full details on the current consumption and operational details.

Actual Measurements	Watts
Module not installed, power applied to Spacely Carrier only	0.12W
Module installed, booted into Ubuntu, idle	3.39W
Module Installed, booted into Ubuntu, running a NVStreamer Demo with a USB camera and 1080p video	10.89W
Module Installed, booted into Ubuntu, running a NVStreamer Demo with a USB camera, 6x MIPI cameras and 1080p video	17.04W



SOFTWARE/BSP DETAILS

All Connect Tech NVIDIA Jetson TX2/TX2i/TX1 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.

Connect Tech's Custom L4T BSP (CTI-L4T)

Connect Tech also offers a custom BSP to add in additional peripheral support on CTI's Jetson Carrier Boards. In the case of the Spacely Carrier Board the CTI-L4T will expose software control of most of the carrier interfaces including GPIO, MIPI CSI-2, CAN, 2x USB3.0, Mini-PCIe and more.

The CTI-L4T can be downloaded directly from Connect Tech here:

<https://www.connecttech.com/jetson>

NVIDIA Jetpack for L4T

The JetPack for L4T is an on-demand all-in-one package that bundles and installs all software tools required to develop for the NVIDIA's TX2i/TX2i/TX1 Platform with Connect Tech's Carrier Boards. JetPack includes host and target development tools, APIs and packages (OS images, tools, APIs, middleware, samples, documentation including compiling samples) to enable developers to jump start their development environment for developing with the Jetson Embedded Platform. The latest release of JetPack runs on an Ubuntu 14.04 Linux 64-bit host system and supports both the latest Jetson TX2/TX2i/TX1 Development Kit and Jetson TK1 Development Kit.

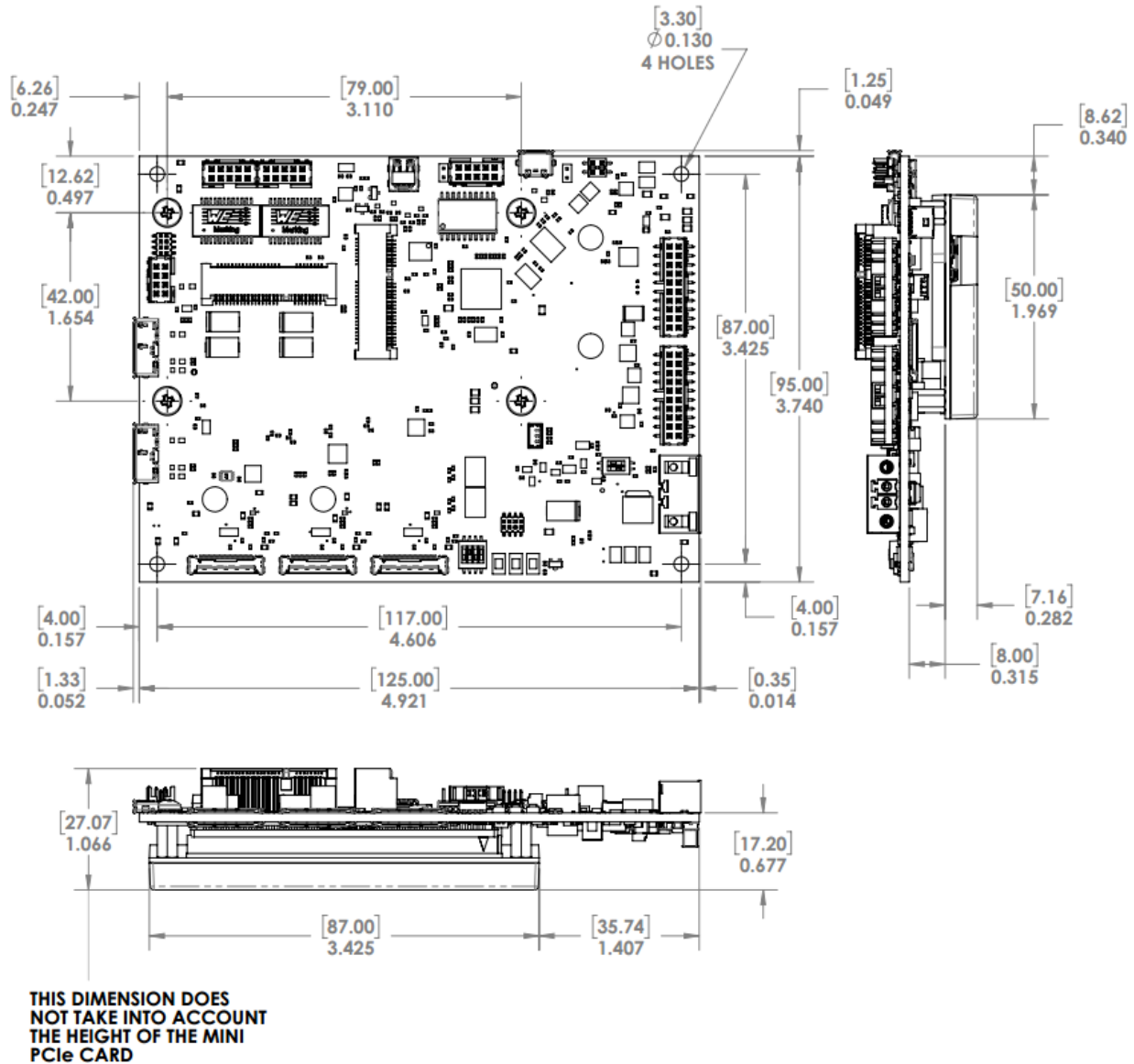
NVIDIA's JetPack can be downloaded directly from NVIDIA here:

<https://developer.nvidia.com/embedded/jetpack>

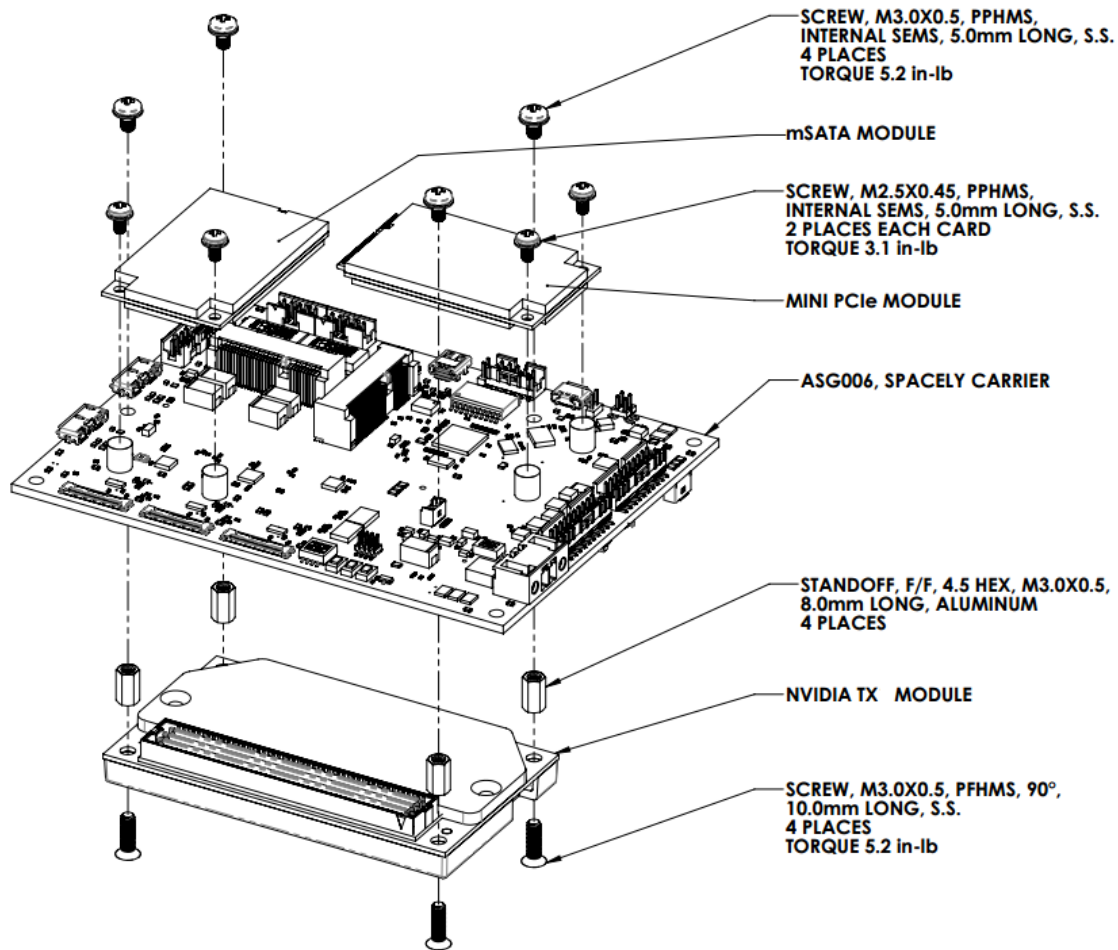


MECHANICAL DRAWINGS & MODELS

Mechanical Dimensions



Module / Mini-PCle / mSATA Installation



Note: Different screws and standoffs are used for installing **TX2-4GB/TX2i**:

- Standoff, FF, 4.5 Hex, Aluminum, M3.0X0.5, 5mm Long
- Screw, M3.0X0.5, PFHMS, 14.0mm Long, S.S. 4 places (TX2i/TX2-4GB Module side)



CABLES

The following table summarizes the Spacely Carrier cables available.

Drawing No.	Part No.	Description
--	<u>CKG045</u>	ASG006 Cable Kit: 2 x CBG116 System Cable - Unterminated wires to 20-pin MiniTek w/Latch, 2 x CBG117 RJ-45 to Minitek Cable, 1 x CBG104 Dual USB 2.0 panel mount to 8-pin MiniTek w/Latch, 1 x CBG191 DB9 to 10-pin Header 2mm.
<u>CTIC-00435</u>	CBG116	System/GPIO (Unterminated) to 20-Pin MiniTek (P12, P13)
<u>CTIC-00433</u>	CBG117	RJ-45 Panel Mount to 10-Pin MiniTek (P4A, P4B)
<u>CTIC-00429</u>	CBG104	Dual USB 2.0 to 8-Pin MiniTek (P8)
<u>CTIC-00539</u>	CBG191	CAN Bus (DB-9 Male) to 10-Pin MiniTek (P7)
--	MSG080	Power Supply for ASG006 / ASG009
<u>CTIC-00538</u>	CBG190	10-pin Minitek to flying Lead Cable optional CANbus cable
<u>CTIC-00477</u>	CBG136	CR2032 RTC Battery w/ 3-pin Connector Cable Assembly
--	CBG247	USB Type A to Micro USB Type B
<u>CTIC-00510</u>	CBG162	External I/O cable for ASG009
--	CBG163	R.FL to SMA Female Cable for ASG009
--	GPS-06T	GPS Active antenna with RF protection circuit, low profile +3VDC to +6VDC input +28dB gain, SMA connector

For latest cable specifications please contact support@connecttech.com

