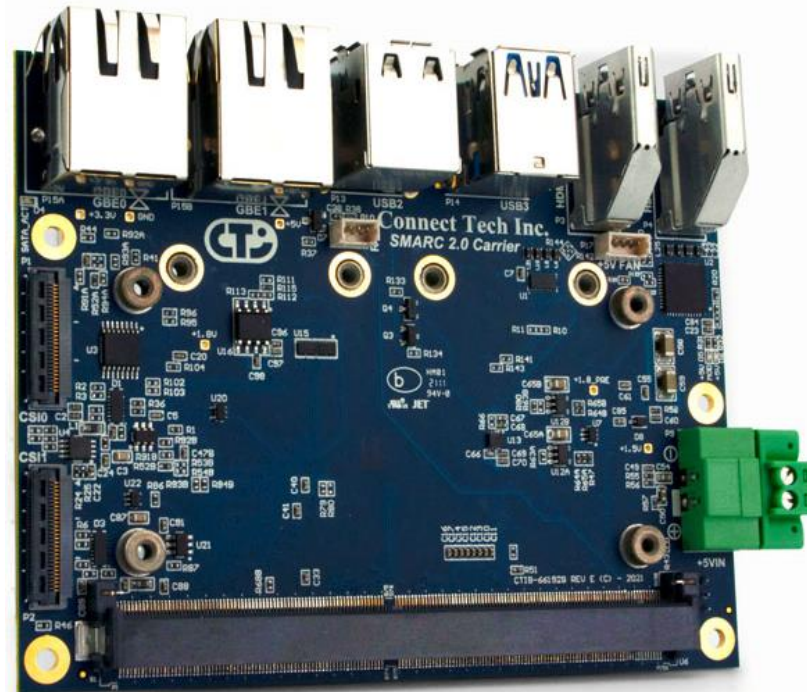




Connect Tech Inc.
Embedded Computing Experts

USERS GUIDE



SMARC 2.0 Carrier

CTIM-00154 Revision 0.04 2021-06-18

CONNECT TECH

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TABLE OF CONTENTS

Table of Contents	2
Preface	3
Disclaimer	3
Customer Support Overview	3
Contact Information	3
Limited Product Warranty	4
Copyright Notice	4
Trademark Acknowledgment	4
ESD Warning	5
Revision History	5
Introduction	6
Product Features and Specifications	6
Part Numbers / Ordering Information	6
Product Overview	7
Block Diagram	7
Connector Summary & Locations	8
Figure 1 Top view	8
Figure 2 Bottom view	8
Jumper/Switch Summary & Locations	9
Detailed Feature Description	10
SMARC 2.0 Connector	10
Fan Connector	11
Video Output	11
MIPI CSI Video Input	12
MIPI CSI x4/x2 Connector	12
MIPI CSI x2 Connector	13
Network	14
USB	14
Mini-PCIe/mSATA Slots	15
Carrier Control DIP Switch	17
HDMI0 DDC Level Translation Select Jumper	17
I2C Connector	18
RS-232 Serial Connector	18
microSD Card Slot	19
GPIO Connector	19
Power Input	20
External RTC Input	20
System Control Connector	21
Typical Installation	22
Cables	22

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 two-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	2017-03-15	Preliminary Release
0.01	2018-06-27	Various Content Updates
0.02	2019-05-31	Updated MIPI connector content added
0.03	2019-06-05	Updated technical info throughout
0.04	2021-06-18	Updated info and added new features

INTRODUCTION

Connect Tech's SMARC 2.0 carrier is an extremely small SMARC carrier board ideal for low power IoT applications as users can take advantage of the integrated on-board wireless capabilities found on the SMARC 2.0 modules. The carrier has USB 3.0, USB 2.0, 2x MIPI CSI-2 camera interfaces, HDMI outputs, microSD, and expansion via two mini PCIe Full size slots.

Connect Tech's SMARC 2.0 carrier board supports the latest generation Apollo Lake x86 low-powered processors and exposes next-generation interconnect (USB 3.0, DDI, MIPI-CSI-2).

SMARC 2.0 supports an extended temperature range of -40°C to +85°C and offers a very small footprint; ideal for mobile or stationary applications.

Product Features and Specifications

Specifications	
Compatibility	All SMARC 2.0 Compliant Modules
Network	2x RJ45 GbE
Display	2x HDMI
USB	2x USB 2.0 (exposed), 2x USB 2.0 (Mini-Pcie), 2x USB 3.0
Storage	1x mSATA, 1x microSD
UART Type	1x RS-232
I2C	1x 3.3V I2C port
GPIO	8 bits of 3.3V I/O
Video Input	1x MIPI CSI-2 (x2 lane), 1x MIPI CSI-2 (x4 lane)
Expansion	2x Mini PCIe Full Sized slots (1 slot mSATA capable)
LEDs	PWR, RESET LEDs
Input Power	+5V DC Input only ($\pm 5\%$)
Dimensions	105.8mm x 82.4mm (4.165" x 3.244")
Operating Temperature	-40°C to +85°C (-40°F to +185°F)

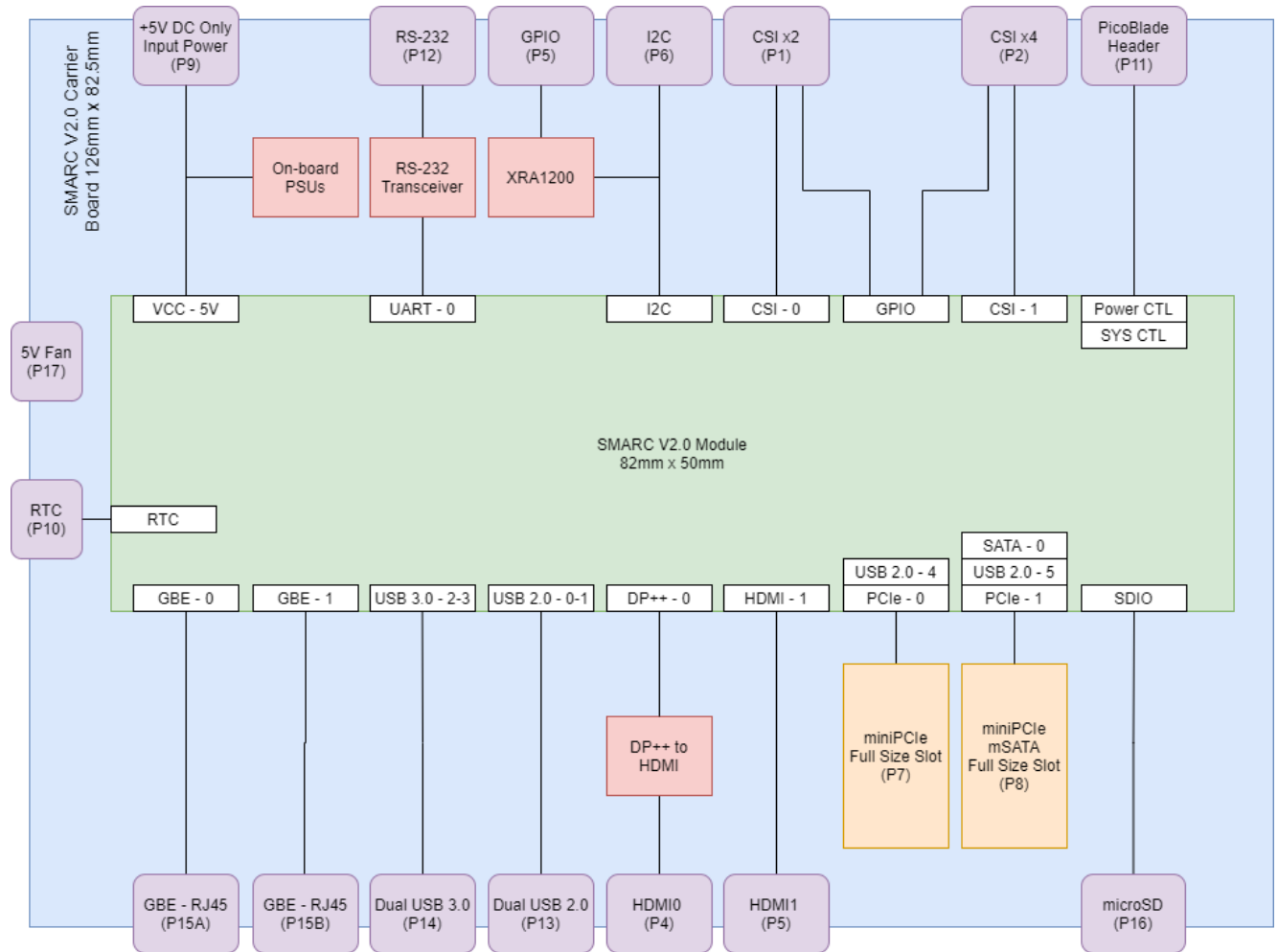
Part Numbers / Ordering Information

Part Number	
SRG004	SMARC 2.0 Carrier



PRODUCT OVERVIEW

Block Diagram





Connector Summary & Locations

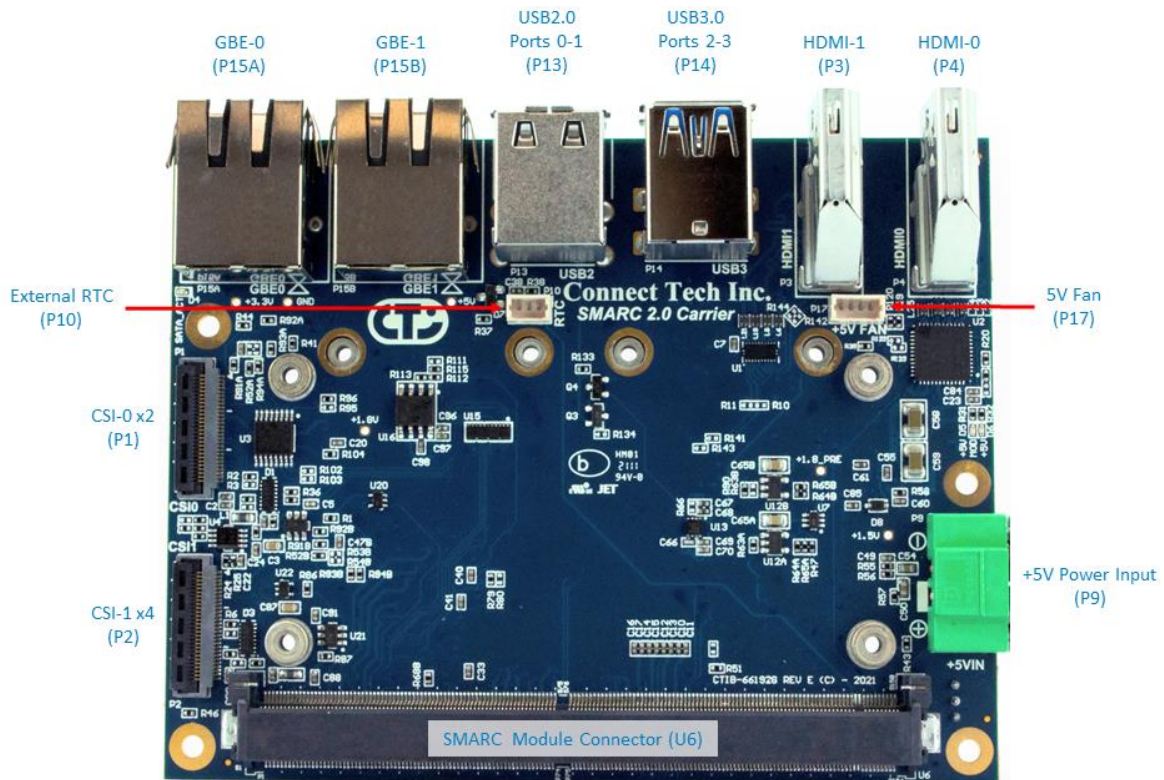


Figure 1 Top view

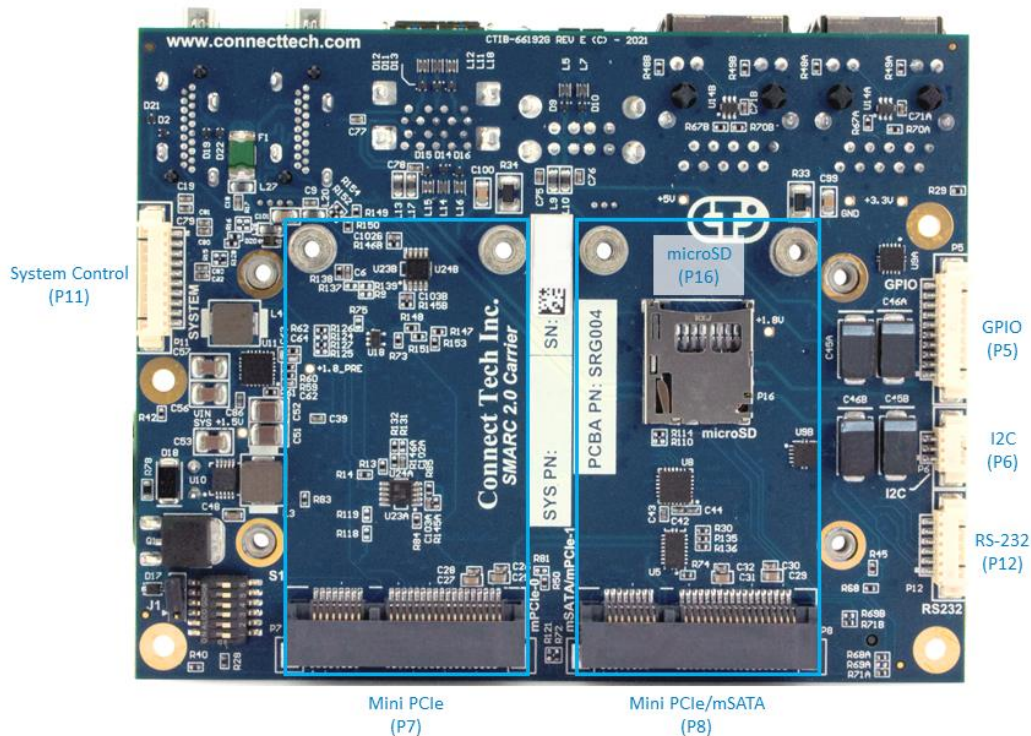


Figure 2 Bottom view

Designator	Description
P3	HDMI0
P4	HDMI1
P5	GPIO Header
P6	I2C Header
P7	Mini PCIe Slot 0
P8	Mini PCIe/mSATA Slot 1
P9	+5V Power Input
P10	External RTC Header
P11	System Control Header
P12	RS-232 Serial Header
P13	USB2.0 double stack, ports 0/1
P14	USB3.0 double stack, ports 2/3
P15A	GBE0
P15B	GBE1
P16	microSD Slot
P17	+5V Fan Header

Jumper/Switch Summary & Locations

Designator	Description
S1	Carrier Control DIP Switch
J1	HDMI0 DDC Level Translation Select Jumper

DETAILED FEATURE DESCRIPTION

SMARC 2.0 Connector

The processor and chipset are implemented on the SMARC 2.0 Module, which connects to the SMARC 2.0 Carrier via an MXM 3.0 fine pitch connector.

Function	Description	
Location	U6	
Type	JAE Electronics MXM 3.0 Connector	
Part Number	PN: MM70-314-310B1-2-R300 Manufacturer: JAE Electronics	
Pinout	Refer to SMARC Hardware Specification V2.0	

Fan Connector

The SMARC 2.0 Carrier implements a 4 pin header for the connection of a +5V fan. No PWM control is available from this header.

Function	Description	
Location	P17	
Type	Molex Vertical PicoBlade	
Part Number	PN: 530470410 Manufacturer: Molex	
Pinout	Pin	Description
	1	5V Pull-up
	2	NC
	3	+5V (FAN VDD)
	4	GND



Video Output

The SMARC 2.0 Carrier implements two HDMI outputs. Both ports are from the SMARC 2.0 module. All connectors are industry standard HDMI Type A upright right angle.

Function	Description
Location	P3, P4
Type	HDMI Type A Video Output
Part Number	PN: 2007435-3 Manufacturer: Texas Instruments
Pinout	Refer to HDMI Connector Type A Specification

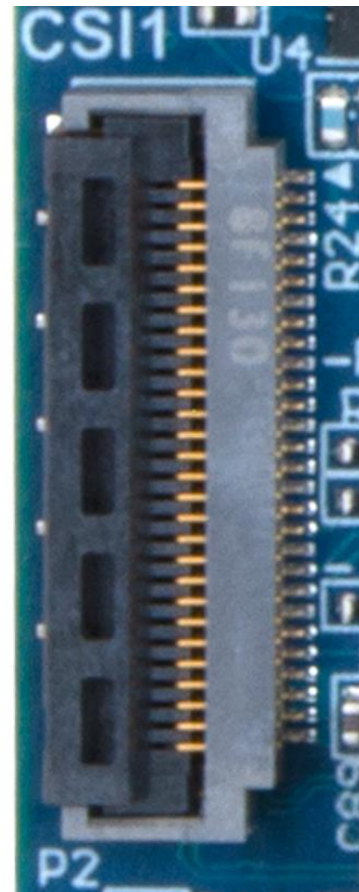


MIPI CSI Video Input

The SMARC 2.0 Carrier implements two MIPI CSI camera inputs through 28 pin Hirose ZIF connectors compatible with Basler BCON cables. The pinout of this connector is compatible with Basler MIPI BCON cameras. For additional information on camera support please contact sales@connecttech.com.

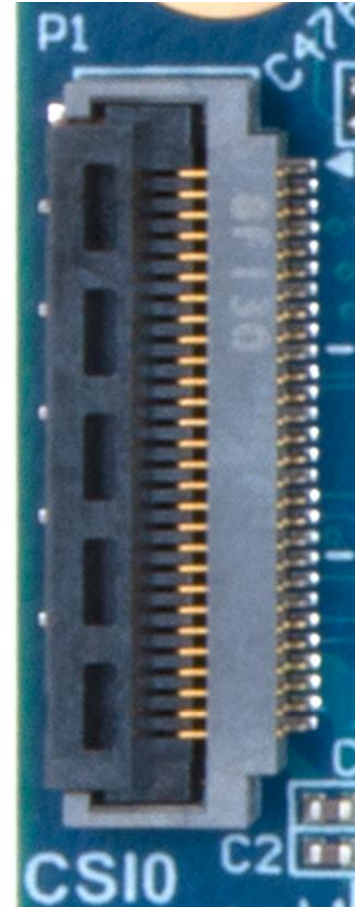
MIPI CSI x4/x2 Connector

Function	Description			
Location	P2			
Part Number	PN: FH41-28S-0.5SH(05) Manufacturer: Hirose			
Mating	Basler BCON: 2200000324			
Pinout	Pin	Description	Pin	Description
	1	GND	18	GPIO (GPIO7) ³
	2	DATA3+ ¹	19	GND
	3	DATA3- ¹	20	I2C_SCL
	4	GND	21	I2C_SDA
	5	DATA2+ ¹	22	GND
	6	DATA2- ¹	23	GPIO (GPIO6)
	7	GND	24	GPIO (GPIO5) ³
	8	CLK+	25	+5V ²
	9	CLK-	26	+5V ²
	10	GND	27	+5V ²
	11	DATA1+	28	GND
	12	DATA1-	29	GND
	13	GND	30	GND
	14	DATA0+	31	GND
	15	DATA0-	32	GND
	16	GND	33	GND
	17	RST# (CAM1_RST#)		
¹ Pins are NC in x2 mode				
² Switched by CAM1_PWR#				
³ Not connected by default (Optional population)				



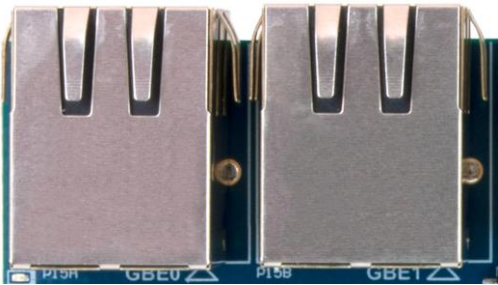
MIPI CSI x2 Connector

Function	Description			
Location	P1			
Part Number	Hirose FH41-28S-0.5SH(05)			
Pinout	Pin	Description	Pin	Description
	1	GND	18	GPIO (GPIO11) ²
	2	NC	19	GND
	3	NC	20	I2C_SCL
	4	GND	21	I2C_SDA
	5	NC	22	GND
	6	NC	23	GPIO (GPIO9)
	7	GND	24	GPIO (GPIO4) ²
	8	CLK+	25	+5V ¹
	9	CLK-	26	+5V ¹
	10	GND	27	+5V ¹
	11	DATA1+	28	GND
	12	DATA1-	29	GND
	13	GND	30	GND
	14	DATA0+	31	GND
	15	DATA0-	32	GND
	16	GND	33	GND
	17	RST# (CAM0_RST#)		
¹ Switched by CAM1_PWR#				
² Not connected by default (Optional population)				



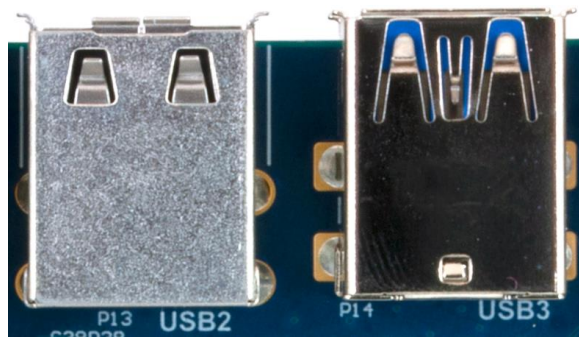
Network

The SMARC 2.0 Carrier implements two 10/100/1000 Ethernet interfaces.

Function	Description	
Location	P15A, P15B	
Type	RJ45 1000BASE-T Ethernet Connector	
Part Number	Pulse JXD0-0001NL	
Pinout	Refer to IEEE 802.3	

USB

The SMARC 2.0 Carrier implements a Dual USB3.0 connector and a Dual USB2.0 connector. All ports are direct from the SMARC 2.0 module. All connectors are industry standard USB3.0/USB2.0 Type A right angle.

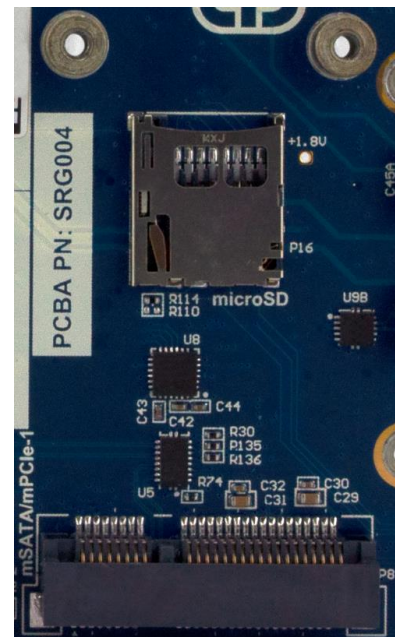
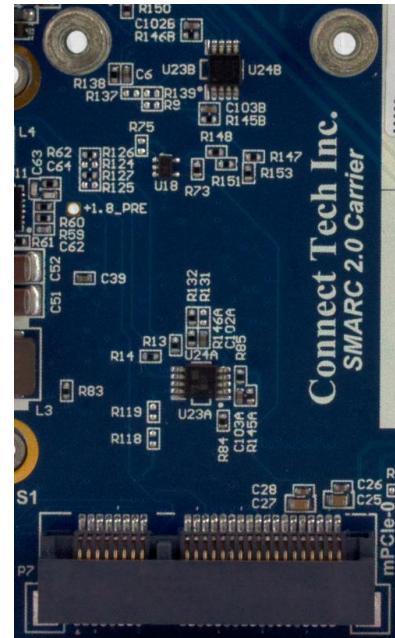
Function	Description	
Location	P13 (USB2.0) P14 (USB3.0)	
Type	USB 2.0/USB3.0 Type A	
Part Number	USB2.0 = Molex 067298-3081 USB3.0 = TE 1932355-4	
Pinout	Refer to Universal Serial Bus 2.0 and 3.0 Specification	

Mini-PCIe/mSATA Slots

The SMARC 2.0 Carrier implements two expansion slots. One is Mini PCIe only and the other is a dual function Mini PCIe/mSATA socket.

The dual purpose functional Mini-PCIe/mSATA socket located at P8 can accept either a Mini PCIe module or an mSATA module. The slot has circuitry that allows for the selection between connecting PCIe lanes or SATA lanes to the connector. This slot also contains a USB 2.0 link as per the Mini PCIe specification.

Function	Description		
Location	P7 (Mini-PCIe only) P8 (Mini-PCIe or mSATA)		
Type	Molex Card Edge Connector		
Part Number	48338-0065		
Pinout	Pin	Mini PCIe Description	mSATA Description
	1	WAKE#	-
	2	+3.3V	+3.3V
	3	-	-
	4	GND	GND
	5	-	-
	6	+1.5V	+1.5V
	7	CLKREQ#	-
	8	-	-
	9	GND	GND
	10	-	-
	11	PCIe CLK-	-
	12	-	-
	13	PCIe CLK+	-
	14	-	-
	15	GND	GND
	16	-	-
	17	-	-
	18	GND	GND
	19	-	-
	20	-	-
	21	RESV	RESV
	22	PERST#	-
	23	PCIe RX-	SATA TX+

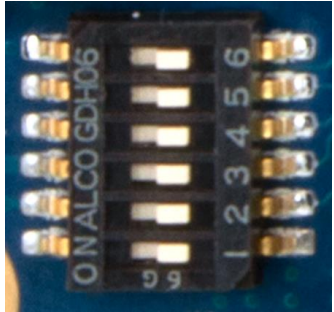




24	+3.3V	+3.3V
25	PCIe RX+	SATA TX-
26	GND	GND
27	GND	GND
28	+1.5V	+1.5V
29	GND	GND
30	SMB_CLK	SMB_CLK
31	PCIe TX-	SATA RX-
32	SMB_DATA	SMB_DATA
33	PCIe TX+	SATA RX+
34	GND	GND
35	GND	GND
36	USB D-	USB D-
37	GND	GND
38	USB D+	USB D+
39	+3.3V	+3.3V
40	GND	GND
41	+3.3V	+3.3V
42	-	-
43	RESV	RESV
44	-	-
45	-	-
46	-	-
47	-	-
48	+1.5V	+1.5V
49	-	-
50	GND	GND
51	-	-
52	+3.3V	+3.3V

Carrier Control DIP Switch

Function	Description			
Location	S1			
Modes	Pin	Description	Function	
			ON	OFF
	1	Mini-PCle/mSATA select	mSATA	Mini-PCle
	2	CARRIER_PWR_ON	Always-ON	Module Controlled
	3	BOOT_SEL0#	GND	OPEN
	4	BOOT_SEL1#	GND	OPEN
	5	BOOT_SEL2#	GND	OPEN
	6	USB_OTG_ID ¹	GND	OPEN
¹ Functionality and support depend on the module vendor. USB0 is the top of the P13 connector				



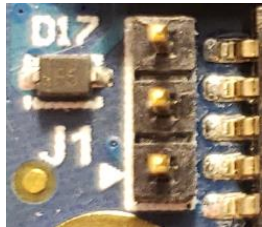
HDMI0 DDC Level Translation Select Jumper

Some SMARC module manufacturers do not use 1.8V signal levels for the HDMI DDC interface, for the best and most reliable performance it is required the correct voltage level is used.

Note that prolonged use at the incorrect voltage level may cause damage. If you are unsure what logic level your SMARC module uses please contact the manufacturer or support@connecttech.com.

Customers using the Congatec conga-SA5 will need to set this jumper to 3.3V (position 1-2).

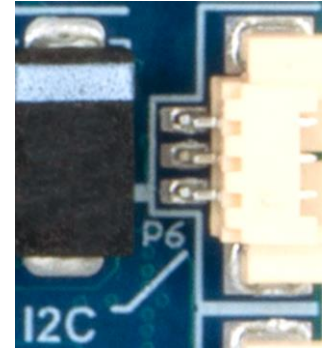
Function	Description	
Location	J1	
Modes	Position	Description
	1-2	3.3V to 5V DDC
	2-3 (Default)	1.8V to 5V DDC



I2C Connector

The SMARC 2.0 Carrier implements a 3 pin header that connects to the I²C interface from the SMARC 2.0 module.

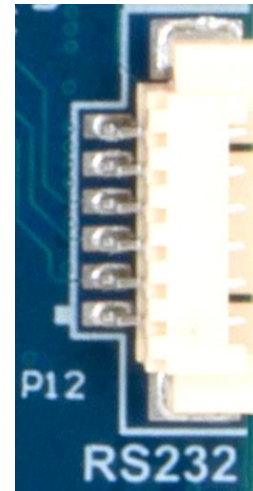
Function	Description		
Location	P6		
Type	Molex Right-Angle PicoBlade		
Part Number	532610371		
Mating	CBG250 (Flying leads)		
Pinout	Pin	Description	SMARC pins
	1	CLK	S48 - I2C_GP_CK
	2	GND	-
	3	DATA	S49 - I2C_GP_DAT
	* 3.3V logic level		



RS-232 Serial Connector

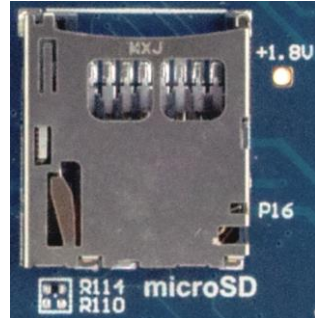
The SMARC 2.0 Carrier implements a 9 pin header that connects to the UART0 interface via an RS232 transceiver from the SMARC 2.0 module.

Function	Description	
Location	P12	
Type	Molex Right-Angle PicoBlade	
Part Number	532610671	
Mating	CBG249 (Flying leads)	
Pinout	Pin	Description
	1	TX Output
	2	RX Input
	3	RTS
	4	CTS
	5	No Connect
	6	GND



microSD Card Slot

The SMARC 2.0 Carrier implements a microSD card connector.

Function	Description	
Location	P16	
Type	Molex microSD Push-Push Type	
Part Number	5025700893	
Pinout	Refer to SD Card Standard	

GPIO Connector

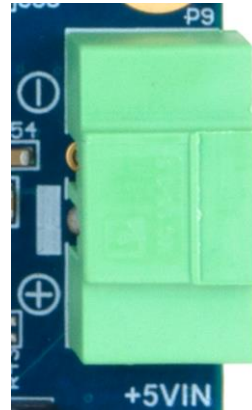
The SMARC 2.0 Carrier implements a 10 pin header that connects to a MaxLinear XRA1200 I²C GPIO expander at address 0x40.

Function	Description	
Location	P5	
Type	Molex Right-Angle PicoBlade	
Part Number	532611071	
Mating	CBG248 (Flying leads)	
Pinout	Pin	Description
	1	GND
	2	GND
	3	GPIO7
	4	GPIO6
	5	GPIO5
	6	GPIO4
	7	GPIO3
	8	GPIO2
	9	GPIO1
	10	GPIO0
* 3.3V logic level		

Power Input

The SMARC 2.0 Carrier accepts a single power input to power all onboard devices. A single +5V DC ($\pm 5\%$) input is required for operation.

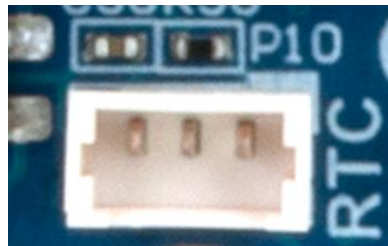
Function	Description	
Location	P9	
Type	Tyco Pluggable Terminal Block	
Part Number	1843790	
Mating	1847055	
Pinout	Pin	Description
	1	+5V DC ($\pm 5\%$)
	2	GND



External RTC Input

The SMARC 2.0 Carrier has an optional external RTC input header.

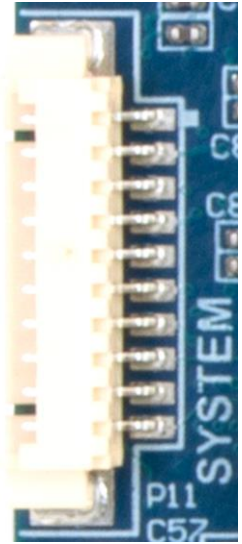
Function	Description	
Location	P10	
Type	Molex Vertical PicoBlade	
Part Number	53047-0310	
Mating	CBG136	
Pinout	Pin	Description
	1	+VDD RTC (3.0V nominal)
	2	No Connect
	3	GND



System Control Connector

The SMARC 2.0 Carrier implements a 10 pin header that connects to several system control signals from the SMARC module.

Function	Description			
Location	P11			
Type	Molex Right-Angle PicoBlade			
Part Number	0532611071			
Mating	CBG248 (Flying leads)			
Pinout	Pin	Description	DIR	
	1	POWER_BTN#	IN	Power-button input from Carrier Board. Active low.
	2	GND	-	-
	3	RESET_IN#	IN	Reset input from Carrier Board. Drive low to force a Module reset, float the line otherwise
	4	GND		
	5	FORCE_RECOV#	IN	Force recovery input from Carrier Board. Active LOW. ¹
	6	GND	-	-
	7	GND	-	-
	8	CARRIER_STBY#	OUT	Module will drive LOW when in standby
	9	CARRIER_PWR_ON	OUT	Output from module to enable the carrier power supplies.
	10	RESET_OUT#	OUT	Reset output from module to carrier. Active LOW.
* All signals use +1.8V CMOS				
¹ Functionality and support depends on the module vendor				



TYPICAL INSTALLATION

1. Ensure all external system power supplies are off.
2. Install the SMARC module into the MXM connector. Be sure to follow the manufacturer's direction for proper heatsink/heat spreader installation and any other cooling instructions from the manufacturer.
3. Install the necessary cables for the application. For the relevant cables, see the Cables and Accessories section of this manual.
4. Connect the power cable to the SMARC 2.0 Carrier then to the power supply.
5. Switch on the power supply. DO NOT power up your SMARC system by plugging in live power.

CABLES

Part Number	Drawing	Description	QTY
MSG068	CTIC-00570	+5V DC Power Kit	1
CBG248	CTIC-00592	10-pin PicoBlade IO cable w/ flying leads	2
CBG249	CTIC-00593	6-pin PicoBlade IO cable w/ flying leads	1
CBG250	CTIC-00594	3-pin PicoBlade IO cable w/ flying leads	1
CBG136	CTIC-00477	RTC Battery Cable	1

For CSI Camera accessories please contact sales@connecttech.com to discuss camera options.