ConnectCore® 6 SBC

Hardware Reference Manual

ConnectCore® 6 SBC Hardware Reference Manual

(Part number 90001418 B)

Revision	Date	Description
A	August 2014	Initial Release
B	March 2015	Replaced the parallel display connector table.

Disclaimers

Information in this document is subject to change without notice and does not represent a commitment on the part of Digi International. Digi provides this document "as is," without warranty of any kind, expressed or implied, including, but not limited to, the implied warranties of fitness or merchantability for a particular purpose. Digi may make improvements and/or changes in this manual or in the product(s) and/or the program(s) described in this manual at any time.

Trademarks and Copyright

Digi, Digi International, and the Digi logo are trademarks or registered trademarks in the United States and other countries worldwide. All other trademarks mentioned in this document are the property of their respective owners.

Warranty

View the product's warranty online: http://www.digi.com/howtobuy/terms

Customer support

Telephone (8:00 am — 5:00 pm CST):

US & Canada: 866.765.9885

Worldwide: 801.765.9885

Online: www.digi.com/support/eservice

Mail:

Digi International

11001 Bren Road East

Minnetonka, MN 55343

USA

Contents

Overview

Using this guide

This guide provides information about the Digi ConnectCore 6 embedded core module family.

Document updates

Check the product specific section on the Digi support website at www.digiembedded.com/support for the most current revision of this document.

Additional resources

Refer to the most recent Freescale i.MX6 processor reference manual and related documentation (available on the Freescale web site at: http://www.freescale.com/imx6) for additional information.

ConnectCore 6 SBC overview

The ConnectCore 6 SBC is a Pico-ITX board featuring the Digi ConnectCore 6 module that integrates a Freescale i.MX6 application processor, DDR3 DRAM memory, eMMC memory, WLAN/Bluetooth module, power management IC for optimized power consumption applications and a programmable microcontroller assistant for supporting additional interfaces.

The ConnectCore 6 SBC provides a selection of I/O interfaces including two USB 2.0 ports, one micro USB OTG connector, micro SD card slot, HDMI, audio jack for stereo audio output and a Gigabit Ethernet port. All these connectors together with the main power connector are located on the front edge of the board making them easily accessible if the board is assembled into an enclosure.

The rear edge of the ConnectCore 6 SBC provides a great selection of multimedia connectors including LVDS, MIPI CSI-2 camera, MIPI DSI display, 8-bit parallel camera and 24-bit parallel display.

Additional on board connectors provide support for SATA interface with power supply, JTAG and console debug ports, coin cell connector to supply the RTC, and expansion connectors for USB, second LVDS, second 8-bit camera interface, two CAN ports, I2C, SPI, three UART ports, twelve GPIOs and audio input and output.

The board provides a mini-PCIe socket for connecting full or half size PCI express mini cards. A micro-SIM card is connected to the mini PCIe slot making the ConnectCore 6 SBC ready for a mini PCIe cellular card.

The ConnectCore 6 SBC also has a connector for a Digi XBee module.

The board is powered from a single 5V DC supply. An overvoltage circuit protects the board from input voltages up to 12V.

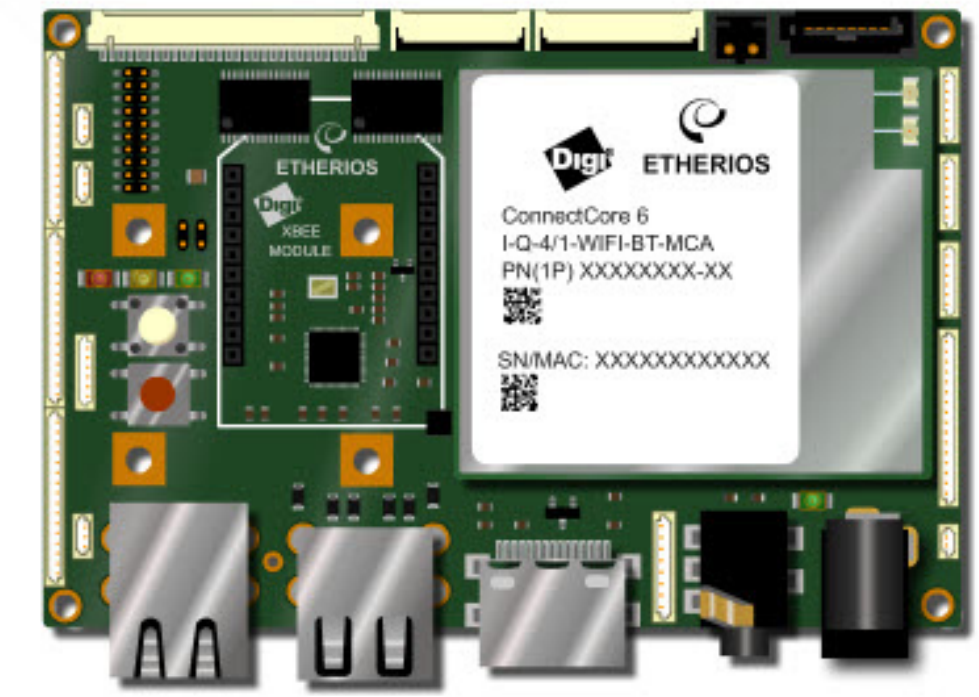
Features and functionality

- ConnectCore 6 module
  - i.MX6 single/dual/quad ARM Cortex-A9 cores operating at speeds of up to 1.2GHz
  - 64-bit DDR3-1066 memory interface with a density up to 2Gbytes
  - 8-bit eMMC support up to revision 4.4/4.41
  - Optional IEEE802.11a/b/g/n WLAN and Bluetooth 4.0
- Power from a single 4.2V to 5.5VDC supply
  - +5V regulator

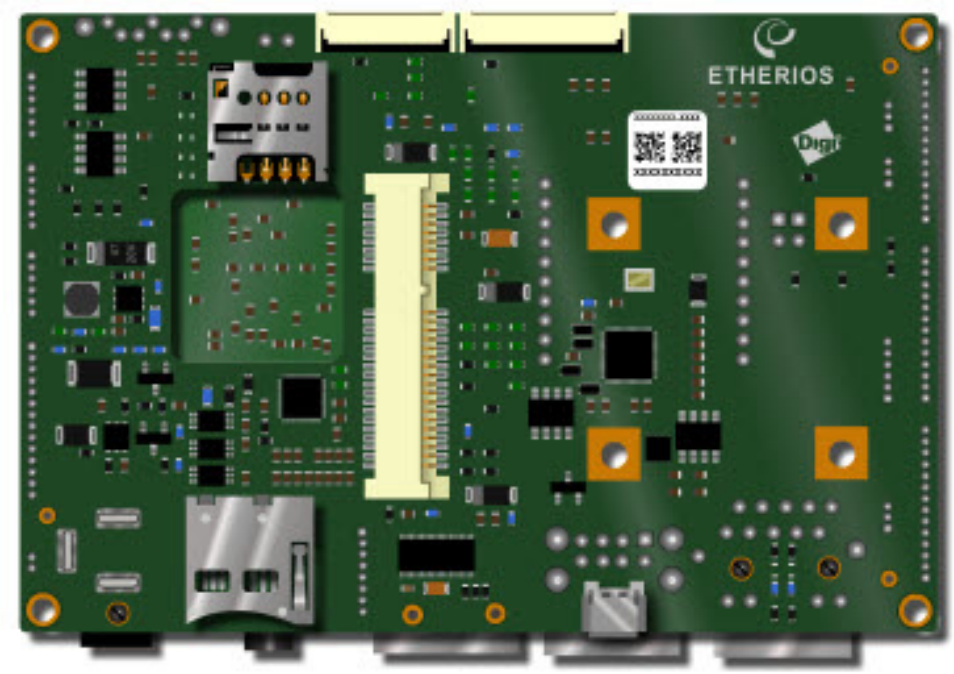
    - Boot source configuration (eMMC, microSD, SATA)
    - Coin-cell connector to supply the on module RTC
    - Power button and reset button
    - Power LED to show the status of the main supply
- Debug
    - Standard IEEE 1149.1 JTAG interface
    - Single Wired Debug (SWD) interface for the microcontroller assistant (MCA)
    - Console serial port
- Storage
    - SATA interface with onboard data and power connectors
    - microSD card slot
- Multimedia
    - Two LVDS interfaces supporting 4 differential data pairs each (one LVDS interface available on expansion connector)
    - 24-bit parallel LCD interface
    - HDMI 1.4 interface
    - MIPI DSI display
    - MIPI CSI-2 camera
    - Two 8-bit parallel camera interfaces (one camera interface available on expansion connector).
    - AC97 audio CODEC with stereo headphone jack
- Communication
    - Gigabit Ethernet interface
    - Mini PCIe slot supporting full size and half size mini PCIe cards
    - microSIM card slot connected to the mini PCIe slot
    - USB OTG with micro AB USB connector
    - Two USB Host 2.0 with stacked USB A type connector
    - XBee socket for Digi XBee THT modules
- Expansion
    - One USB Host 2.0 port
    - Two CAN ports
    - Three UART ports (one TTL level and two RS232)
    - SPI
    - I2C
    - One LVDS interface (the other available at LVDS connector)
    - Audio connector with MIC, LINE-IN and LINE-OUT

  - GPIO connector with 4 analog inputs and 8 digital GPIO signals
  - Power connector with reset and power signals
  - One Eight bit parallel camera interface (the other available at camera connector)
- User interface
  - Three user LEDs (green, yellow, red)
- Dimensions
  - Pico-ITX form factor, 100mm x 72mm

Placement - top side

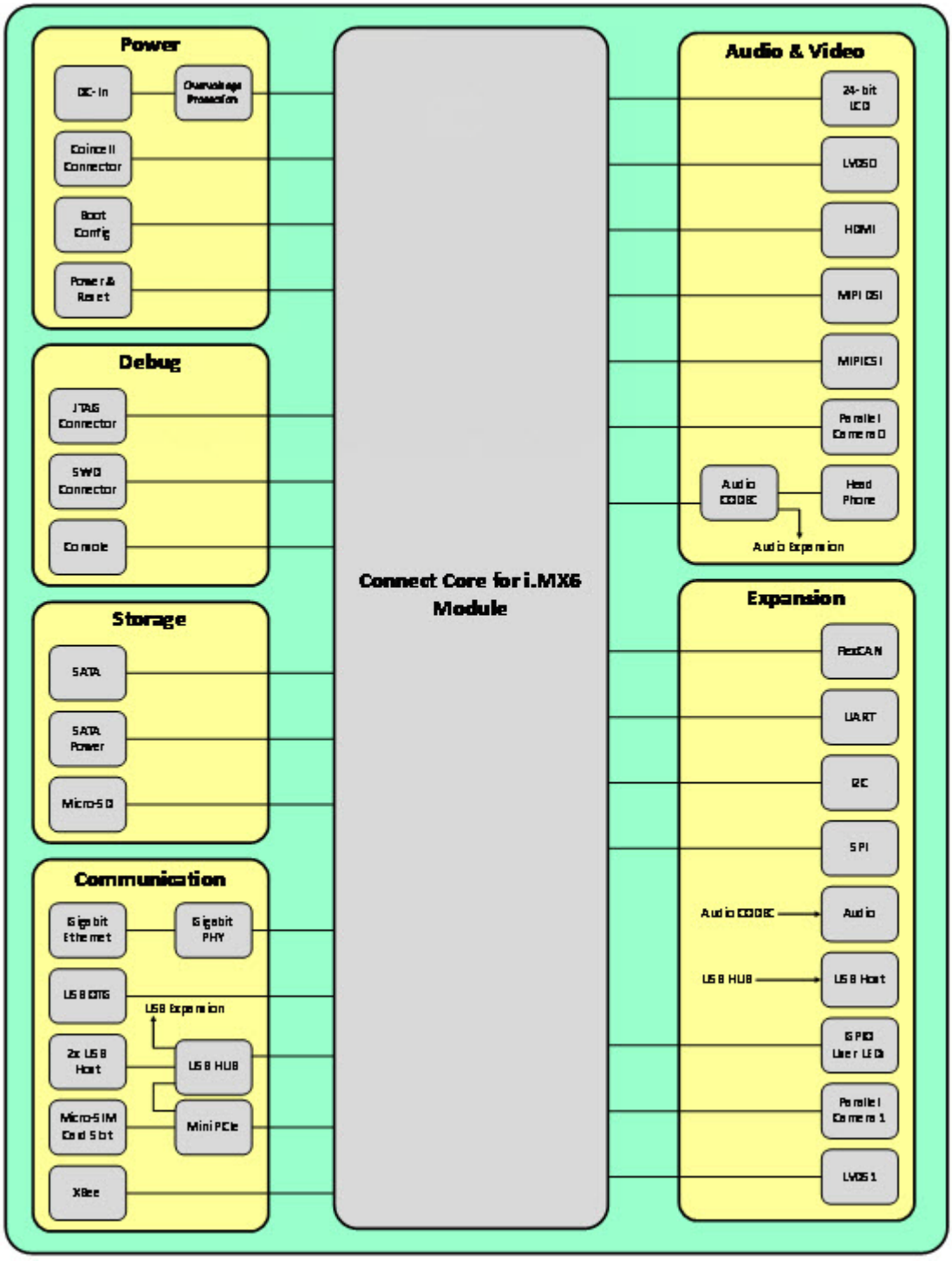


Placement - bottom side

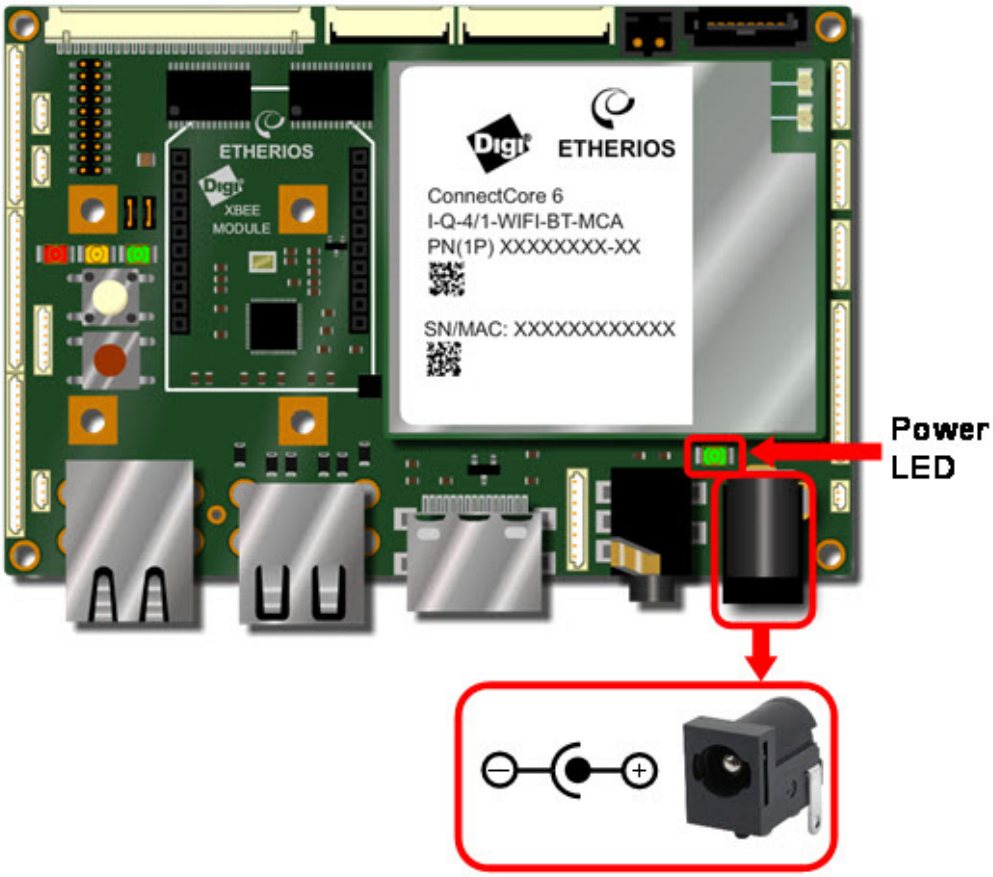


SBC block diagram

The figure below shows the block diagram of the ConnectCore 6 SBC.



DC-in connector



The ConnectCore 6 SBC has a +5V DC-In power connector (J1) to provide power to the system. A DC-Jack connector is used to connect the DC-In power supply.

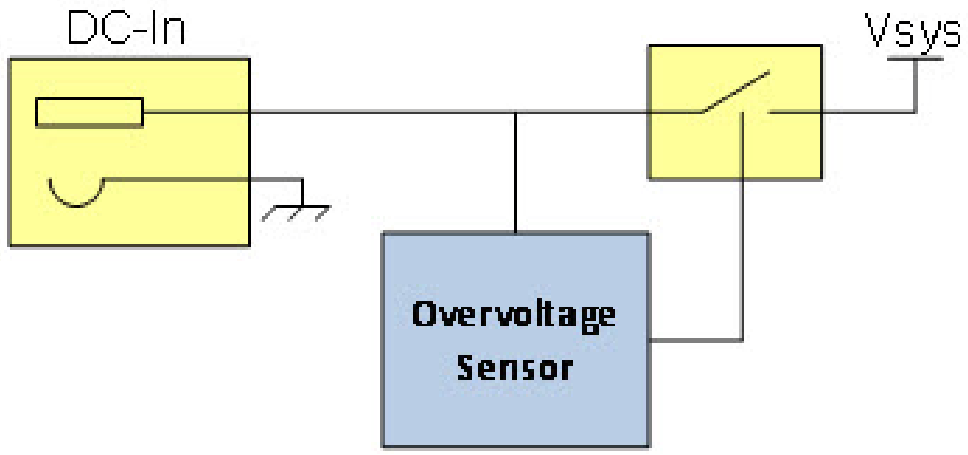
Power LED

A green LED near the power connector shows the status of the power input. This LED is ON when a valid power supply is present. If the power supply voltage is higher than 5.5V the overvoltage protection circuit will block the power supply input and the power LED will turn off.

LED	Signal	Note
POWER	VSYS	Green LED

Overvoltage protection

An overvoltage protection circuit is implemented on the ConnectCore 6 SBC. If the voltage value of the DC-In supply signal is higher than 5.5V the supply input is disconnected of the system.



5V regulator

The ConnectCore 6 SBC has several interfaces that need a regulated 5V supply. To generate this supply one LTC3125 step-up DC/DC converter is used. This DC/DC converter can generate a regulated 5V from an input supply ranging from 1.8V to 5.5V. The LTC3125 will maintain voltage regulation even when the input voltage is above the desired output voltage.

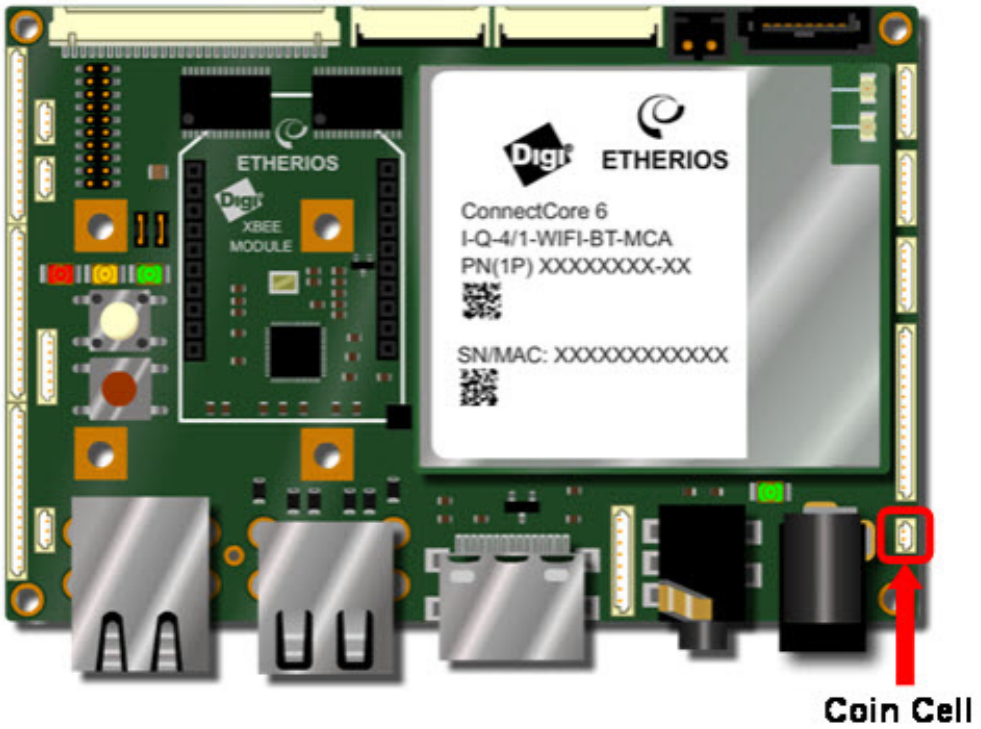
The 5V regulator is enabled by the ConnectCore 6 signal PWR_EN (PMIC_GPIO7). On low power mode this regulator is disabled.

The following table lists the interfaces of the ConnectCore 6 SBC that are sourced from the +5V supply.

Interface	Comments
USBH1_VBUS	Power supply for the USB Host controller of the i.MX6 CPU
SATA	Supply for the SATA interface
USB OTG	Supply for the USB devices connected to the USB OTG
USB Host	Supply for the USB devices connected to the USB Host ports
LVDS0	Supply for the LVDS backlight
HDMI	Supply for the HDMI display

Interface	Comments
Parallel display	Supply for the parallel display
MIPI display	Supply for the MIPI display
MIPI camera	Supply for the MIPI camera

SBC coin cell connector



The ConnectCore 6 SBC provides a 2-pin, 1.25mm pitch straight connector for connecting an external coin cell or super capacitor to power the RTC interface when the main supply is off. If higher voltage is present on the main supply, it will be used as a power source for the RTC.

The following table shows the pinout of the coin cell connector.

Pin	Signal	Comments
1	VCC_LICELL	Power supply for RTC
2	GND	Ground

There are three types of components that can be connected to this connector: Lithium coin cells (Primary cell: non-rechargeable), Lithium coin cells (Secondary cell: rechargeable), and Supercaps. When a Primary Lithium coin cell is connected, the PMIC backup battery charger must be turned off and this pin is used strictly as an input. It is hazardous to attempt to charge Primary Lithium cells as they may vent or explode. Secondary Lithium coin cells are only made available directly to manufacturers of equipment that could use them, in that case they are normally required to design their product to prevent the user gaining access to this part since there is a danger to the user if by replacing it, they fit a primary type (the only sort that they are likely to be able to source) into the charging circuit. When a Secondary Lithium coin cell is used, both the charging current and the

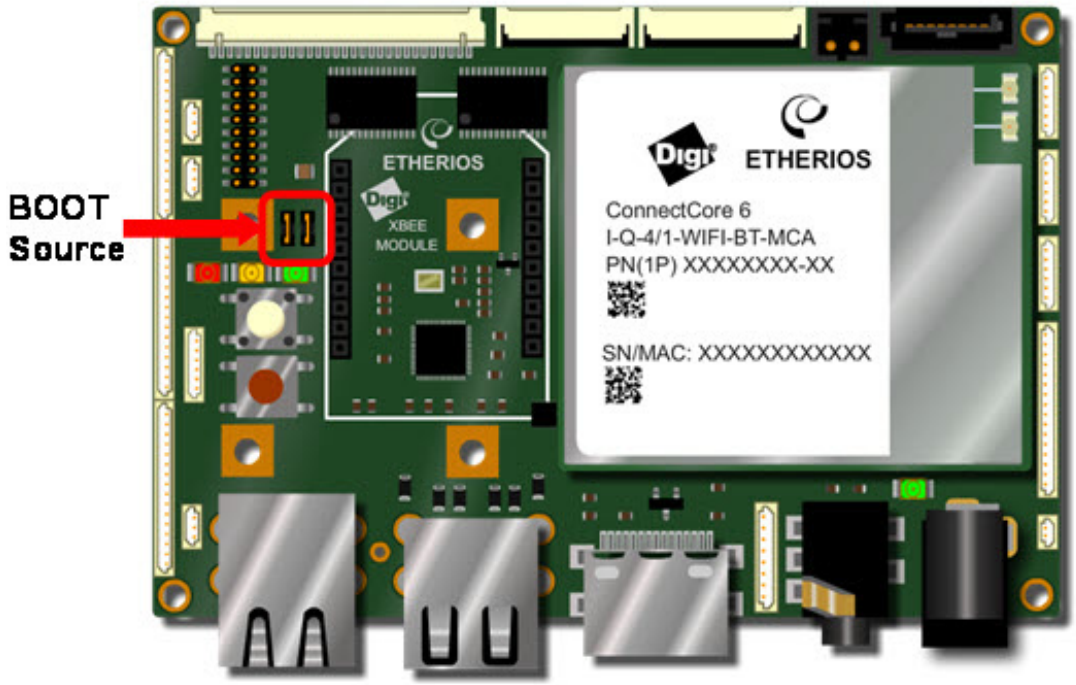
termination voltage are programmable. When a Supercap is used, both the charge current and termination voltage should be set to the maximum values.

The advantage of using a Primary Lithium coin cell is that the energy density usually allows years of service since the self discharge rate is low. The advantage of using a Secondary Lithium coin cell is that the self discharge rate is usually sufficient to allow a few months of support for the RTC before it will need recharging. The advantage of the Supercap is that it is intrinsically safe and can out-last the Primary Lithium coin cell option, however the self discharge rate is high meaning that a 1F capacitor at 25° C is likely to support the RTC for approximately five to ten days.

A programmable constant charge current charger with a programmable top-off charging voltage is provided for charging of Secondary Lithium-Manganese coin cell batteries and super capacitors. Charging current is programmable from 100uA to 6mA. Termination voltage is programmable from +1.1 to +3.1V.

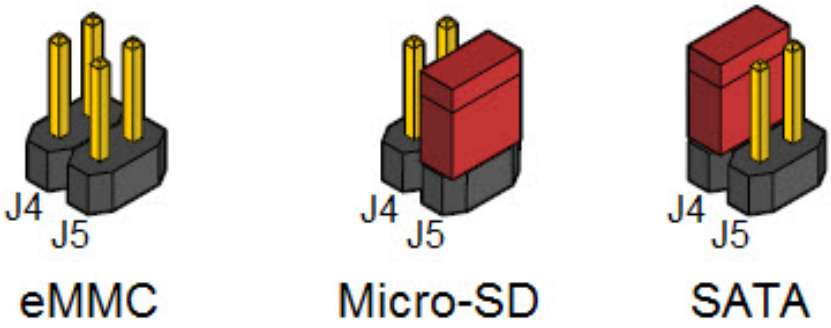
The minimum voltage of the coin cell supply is +2V. The maximum voltage of the coin cell supply is +3.6V.

SBC boot configuration



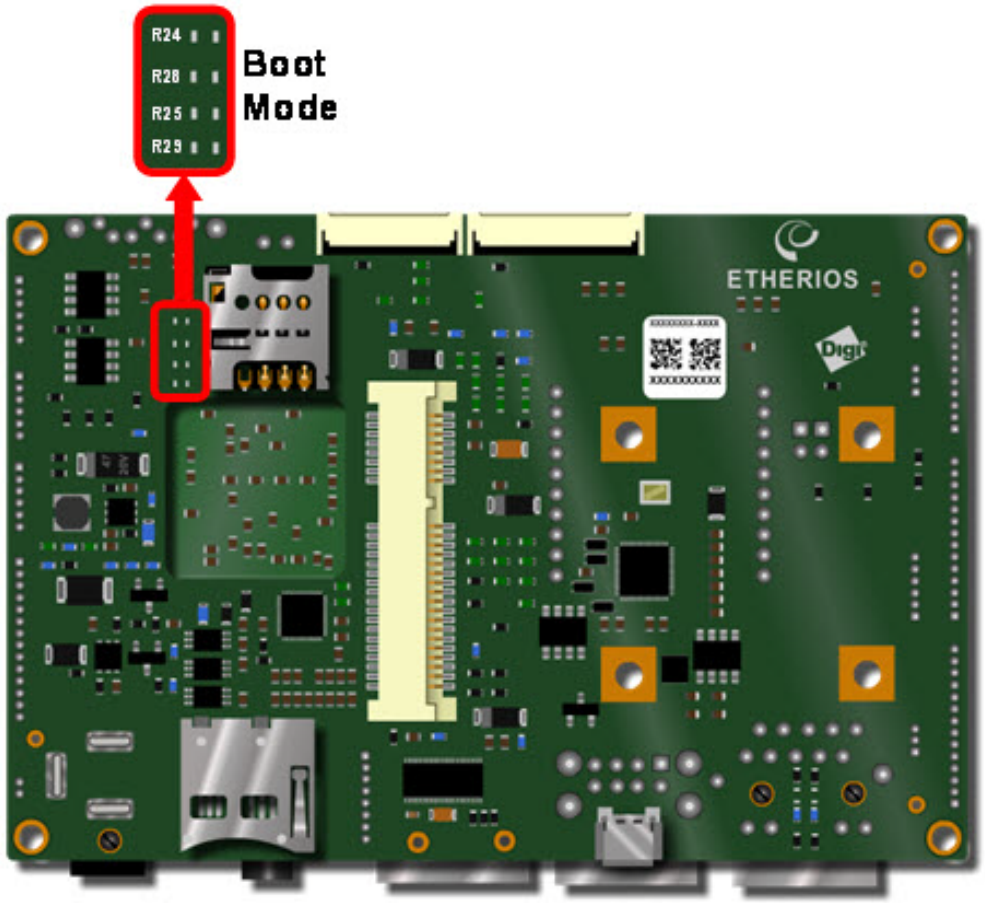
SBC boot source jumpers

The ConnectCore 6 SBC provides two jumpers to configure the boot source.



J4	J5	Comments
Open	Open	Boot from eMMC
Open	Close	Boot from Micro-SD
Close	Open	Boot from SATA
Close	Close	Reserved

Boot mode



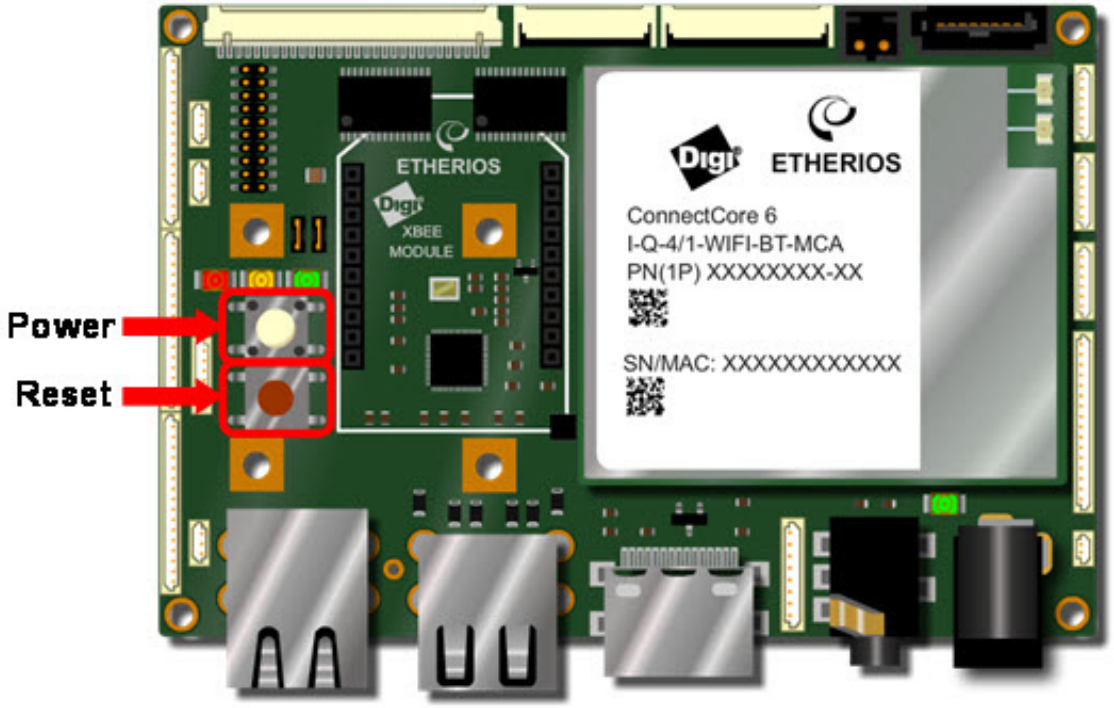
ConnectCore 6 SBC provides four resistors to configure the boot mode. These resistors are used to override the boot mode configuration selected on the ConnectCore 6 module. By default these four resistors are not populated and the ConnectCore 6 SBC will boot with the default boot mode selected on the module.

The following table shows the resistors configuration for the different boot modes.

R24	R25	R28	R29	Boot Mode
Not populated	Not populated	Not populated	Not populated	Module default boot mode
Not populated	Not populated	populated	populated	Boot from Fuses
Not populated	Populated	populated	Not populated	Serial Downloader
Populated	Not populated	populated	Populated	Boot from board settings

Note A different resistors configuration than the ones listed on the table might prevent the ConnectCore 6 SBC from booting.

Power and reset functions

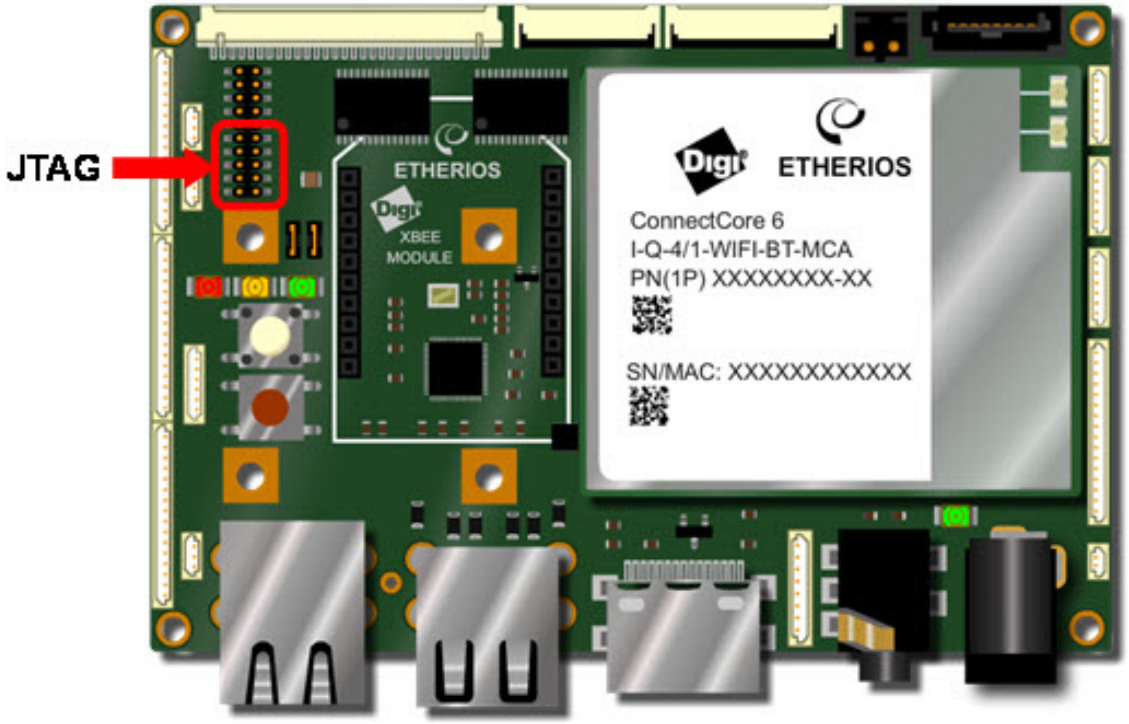


The ConnectCore 6 SBC provides a “Power” button that supports the following functionality:

Function	Description
Power On	Short press when the board is OFF.
Power Off	Long press for 10 seconds when the board is ON or in SLEEP mode.
Wake-up	Short press when the board is in SLEEP mode.
Sleep	Short press when the board is ON.

The ConnectCore 6 SBC provides a “Reset” button is used to reset the ConnectCore 6 module.

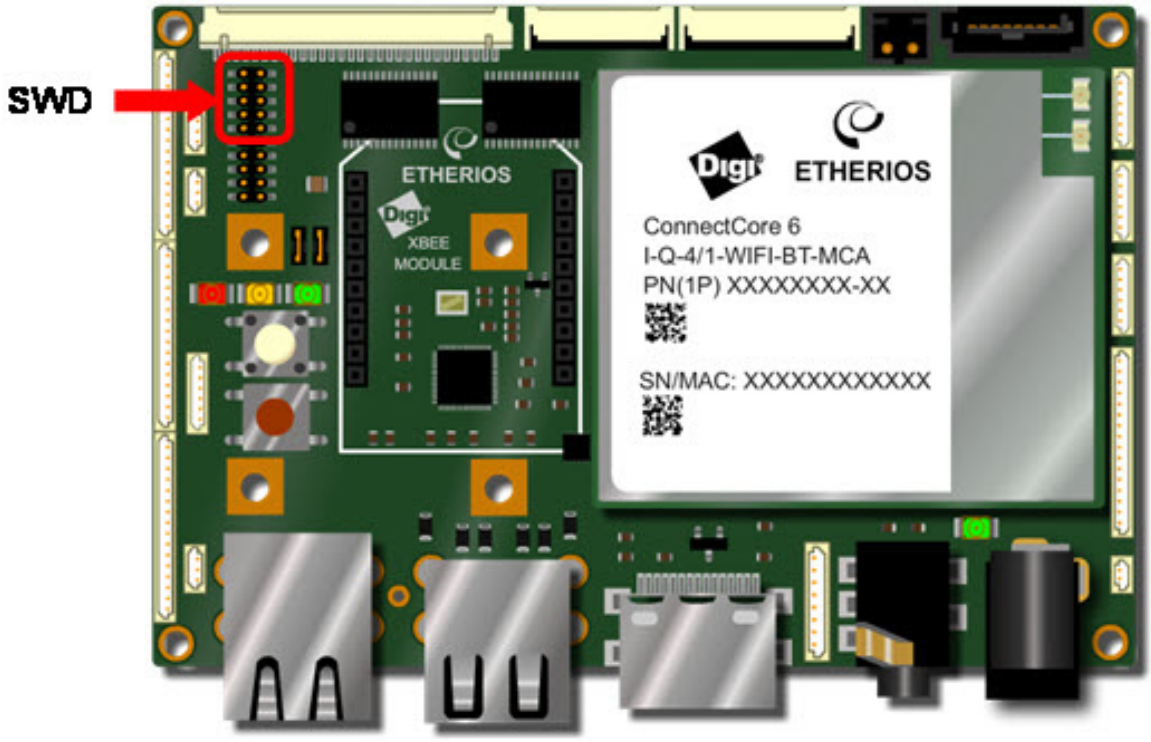
JTAG



The ConnectCore 6 SBC provides a 2x5, 1.27mm pitch pin header for accessing the i.MX6 JTAG Debug port. The pinout of the JTAG connector is compliant with the 10pin standard ARM JTAG. The following table shows the pinout of the JTAG connector.

Pin	Signal	Comments
1	3.3V	Supply voltage of the JTAG interface
2	JTAG_TMS	Test mode state signal
3	GND	
4	JTAG_TCK	Test clock signal
5	GND	
6	JTAG_TDO	Test data output signal
7	-	
8	JTAG_TDI	Test data input signal
9	GND	
10	POR_N	Board reset/CPU reset

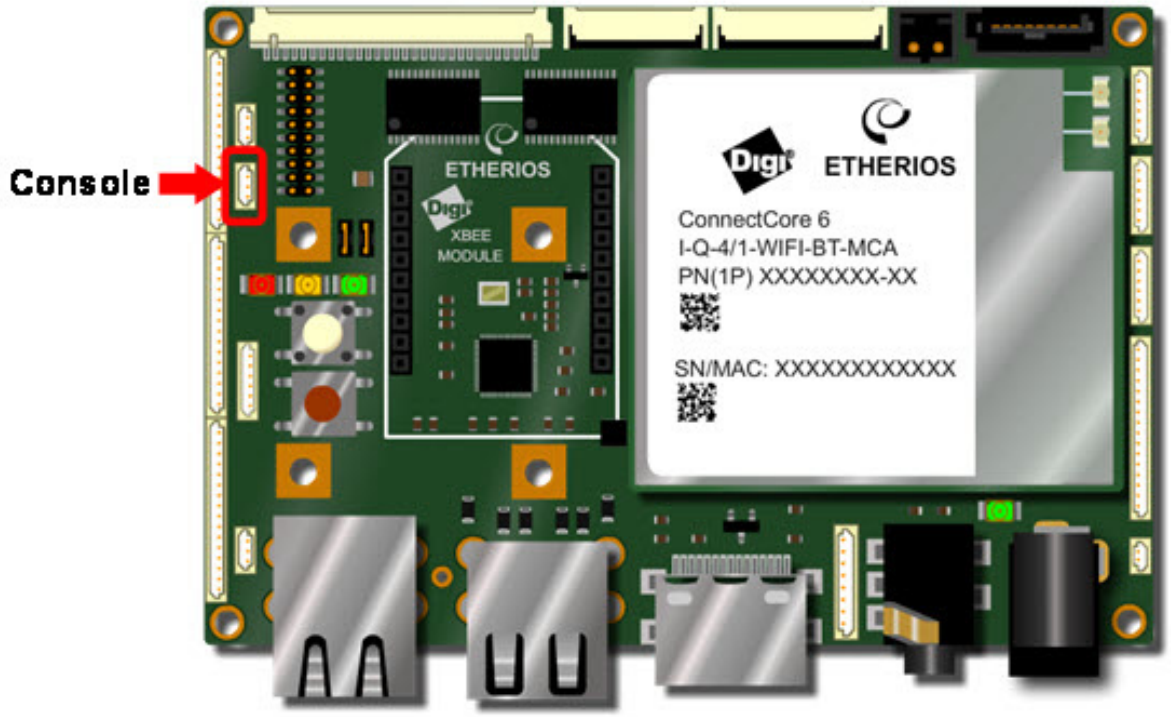
SWD



The ConnectCore 6 SBC provides a 2x5, 1.27mm pitch pin header for programming and debugging the Kinetis microcontroller assistant of the ConnectCore 6 module. The pinout of the SWD connector is compliant with the 10pin standard SWD. The following table shows the pinout of the SWD connector.

Pin	Signal	Comments
1	VLDO_MCA	Supply voltage of the Kinetis MCA
2	SWD_DIO	SWD bidirectional data pin
3	GND	
4	SWD_CLK	SWD clock signal
5	GND	
6	-	
7	-	
8	-	
9	GND	
10	MCA_RESET_N	Reset signal for Kinetis MCA

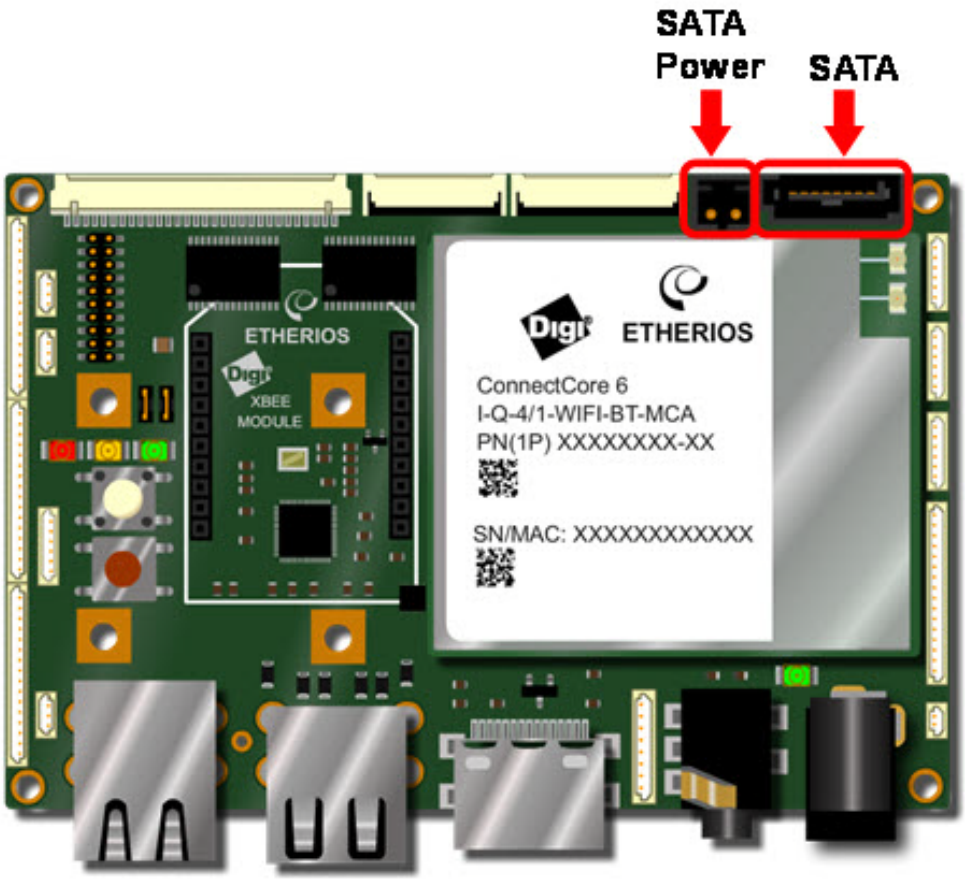
SBC console port



The ConnectCore 6 SBC provides a 3pin, 1.25mm pitch connector for the debug console port. The UART4 port of the ConnectCore 6 module is used as console port. An RS232 transceiver is used on the SBC to convert the port to standard RS232 levels. The following table shows the pinout of the SWD connector.

Pin	Signal	Comments
1	CONSOLE_TX	RS232 transmission line
2	CONSOLE_RX	RS232 reception line
3	GND	

SATA



The ConnectCore 6 SBC provides access to the SATA interface on the ConnectCore 6 module using a vertical SATA standard connector.

The table below provides the pinout of the SATA connector.

Pin	Signal	Comments
1	GND	
2	SATA_TXP	SATA transmission pair positive line
3	SATA_TXN	SATA transmission pair negative line
4	GND	
5	SATA_RXN	SATA reception pair negative line
6	SATA_RXP	SATA reception pair positive line
7	GND	

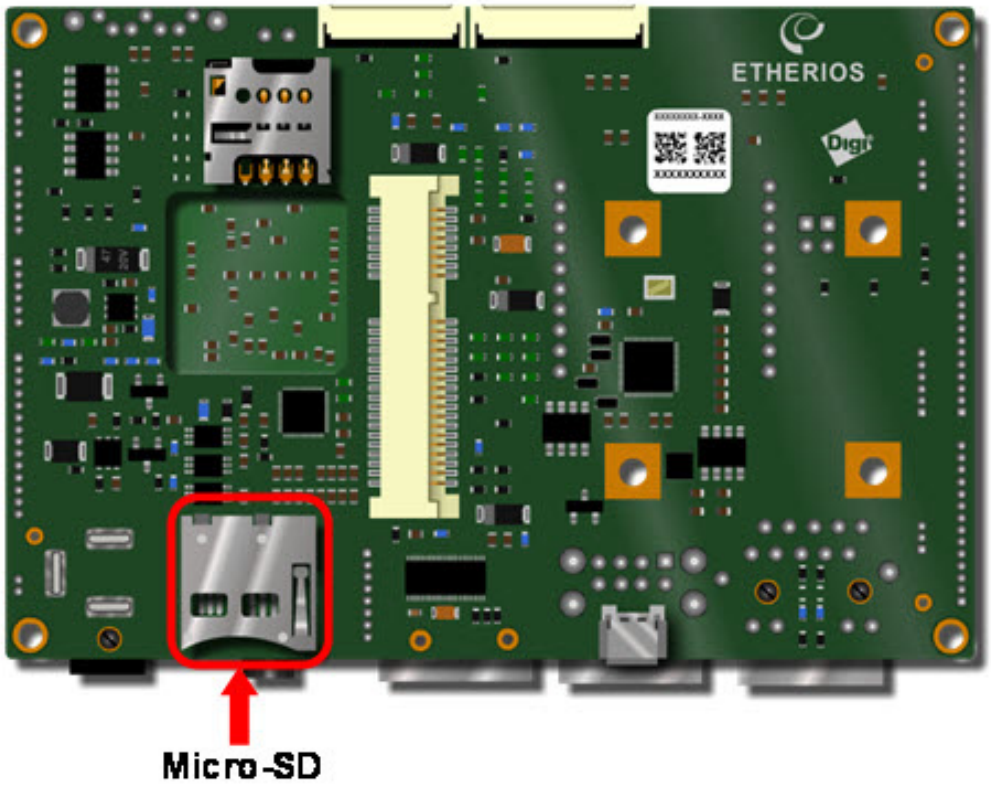
The ConnectCore 6 provides a 2pin connector to supply a SATA device with +5V.

Note For SATA devices that need more than 1A an external 5V supply is required.

The table below shows the pinout of the SATA power connector.

Pin	Signal	Comments
1	5V	
2	GND	

Micro SD

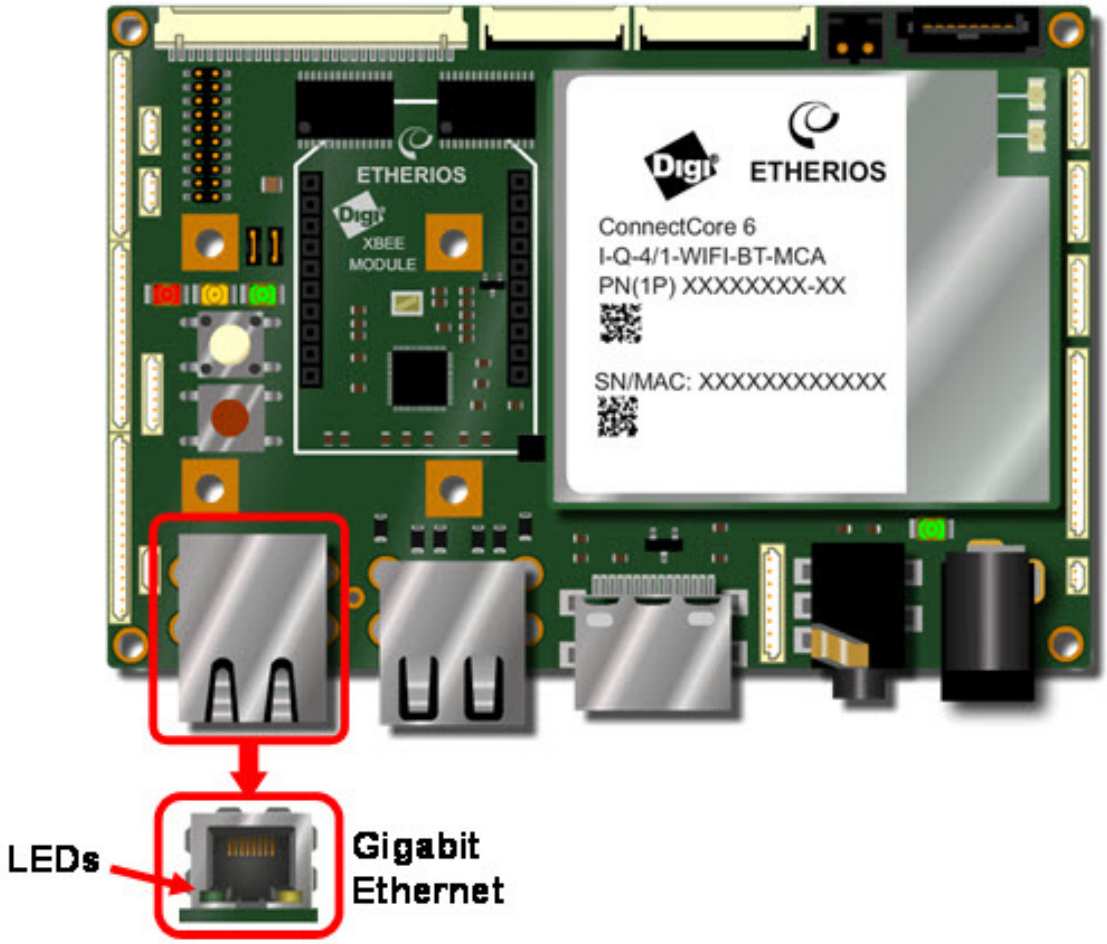


The ConnectCore 6 SBC provides a Micro-SD connector on the bottom side. This interface is connected to the USDHC2 controller of the i.MX6 CPU.

The Micro-SD connector does not provide a card detect pin. The following table shows the pinout of the micro-SD connector.

Pin	Signal	Comments
1	SD2_DATA2	
2	SD2_DATA3	
3	SD2_CMD	
4	3.3V	
5	SD2_CLK	
6	GND	
7	SD2_DATA0	
8	SD2_DATA1	

Gigabit ethernet

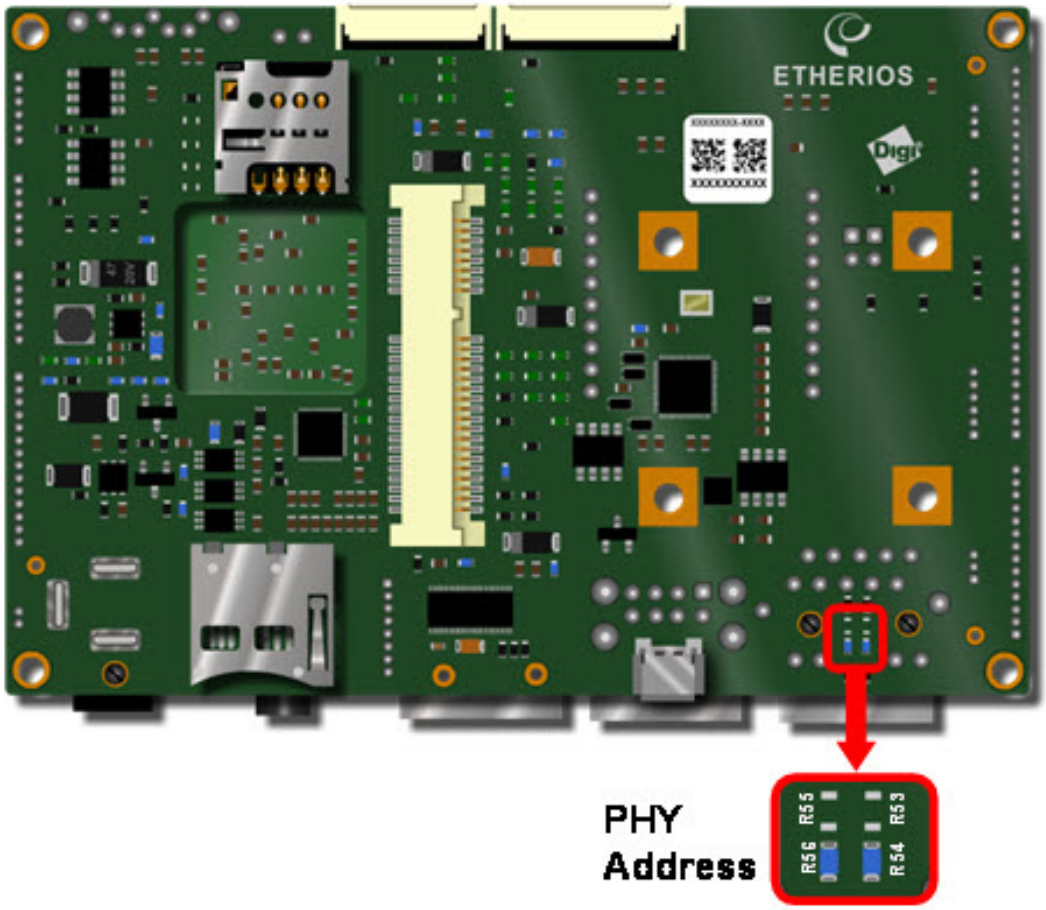


The ConnectCore 6 SBC has a triple-speed (10Base-T/100Base-Tx/1000Base-T) Ethernet PHY connected to the RGMII interface of the ConnectCore 6 module. Two GPIO signals of the i.MX6 CPU are used to reset the Ethernet PHY (GPIO1_25) and as interrupt input from the PHY (GPIO1_28).

The board provides a Gigabit RJ-45 connector with integrated 1:1 transformer and link/activity LEDs. The following table shows the pinout of the Gigabit connector.

Pin	Signal	Comments
1	TRP1+	Transmit and receive pair 1 data +
2	TRP1-	Transmit and receive pair 1 data -
3	TRP2+	Transmit and receive pair 2 data +
4	TRP2-	Transmit and receive pair 2 data -
5	TRP3+	Transmit and receive pair 3 data +
6	TRP3-	Transmit and receive pair 3 data -
7	TRP4+	Transmit and receive pair 4 data +
8	TRP4-	Transmit and receive pair 4 data -

Gigabit ethernet PHY address



The ConnectCore 6 SBC has a Gigabit PHY for the Ethernet interface. The address of the Gigabit PHY can be configured with four configuration resistors. The default address for the Gigabit PHY is 0x0. The following table shows the different Gigabit PHY address configuration.

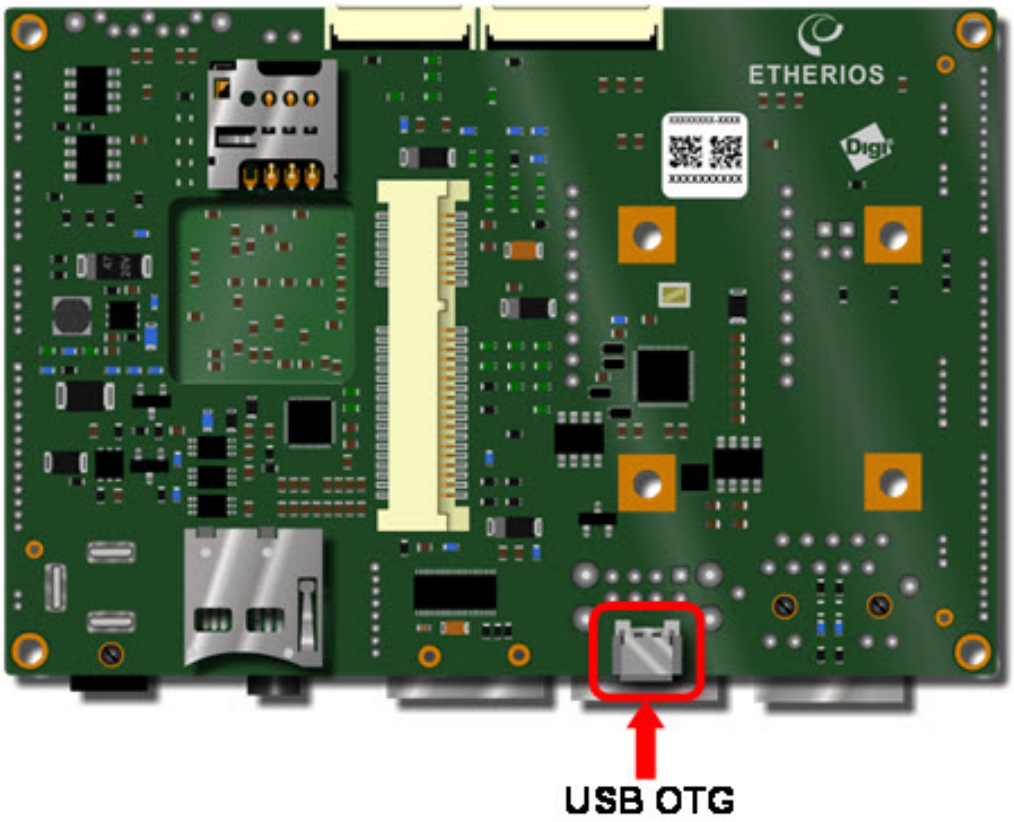
R53	R54	R55	R56	PHY Address
Not populated	Populated	Not populated	Populated	0x0
Populated	Not populated	Not populated	Populated	0x1
Not populated	Populated	Populated	Not populated	0x2
Populated	Not populated-	Populated	Not populated	0x3

Gigabit ethernet LEDs

The Gigabit Ethernet PHY has two outputs to indicate the link and activity status of the port. These outputs are connected to a green LED and to a yellow LED, integrated on the Ethernet connector. The following table shows the link/activity status indicated by the two LEDs.

Yellow LED	Green LED	Link/Activity Status
OFF	OFF	Link off
ON	OFF	1000 Link/No activity
Blinking	OFF	1000 Link/No activity (Rx, Tx)
OFF	ON	100 link/No activity
OFF	Blinking	100 Link/activity (Rx, TX)
ON	ON	10 Link/No activity
Blinking	Blinking	10 Link/Activity (Rx, Tx)

USB OTG



The ConnectCore 6 SBC provides a micro-AB type receptacle for a USB OTG connection. This interface can operate in Host mode and Device (peripheral) mode.

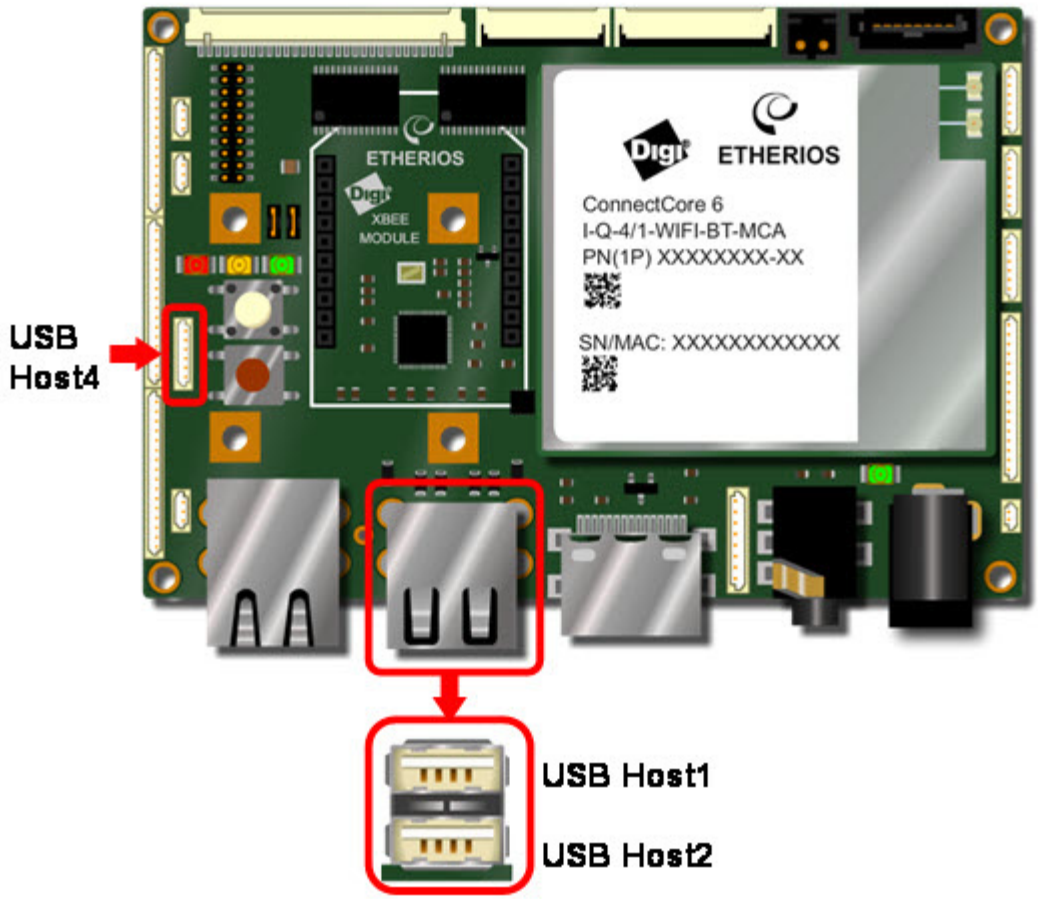
High speed, Full speed and Low speed connections are supported in Host mode. High speed and Full speed connections are supported in peripheral mode.

When the interface is configured in Host mode a 5V supply is connected to pin 1 (VBUS) of the USB connector.

The following table shows the pinout of the USB OTG connector.

PIN	Signal	Comments
1	VBus	5V output on host mode
2	USB_DN	
3	USB_DP	
4	USB_ID	GND for host and floating for device
5	GND	

USB host



The ConnectCore 6 SBC has a 4-port USB HUB that provides four USB Host interfaces. Two USB Host interfaces are connected to a stackable dual USB A-type connector located on the front of the board. The USB Host3 port is connected to the PCI express mini card connector. The USB Host4 port is connected to a 6pin, 1.25mm pitch expansion connector. All the USB ports can operate at high speed, full speed and low speed.

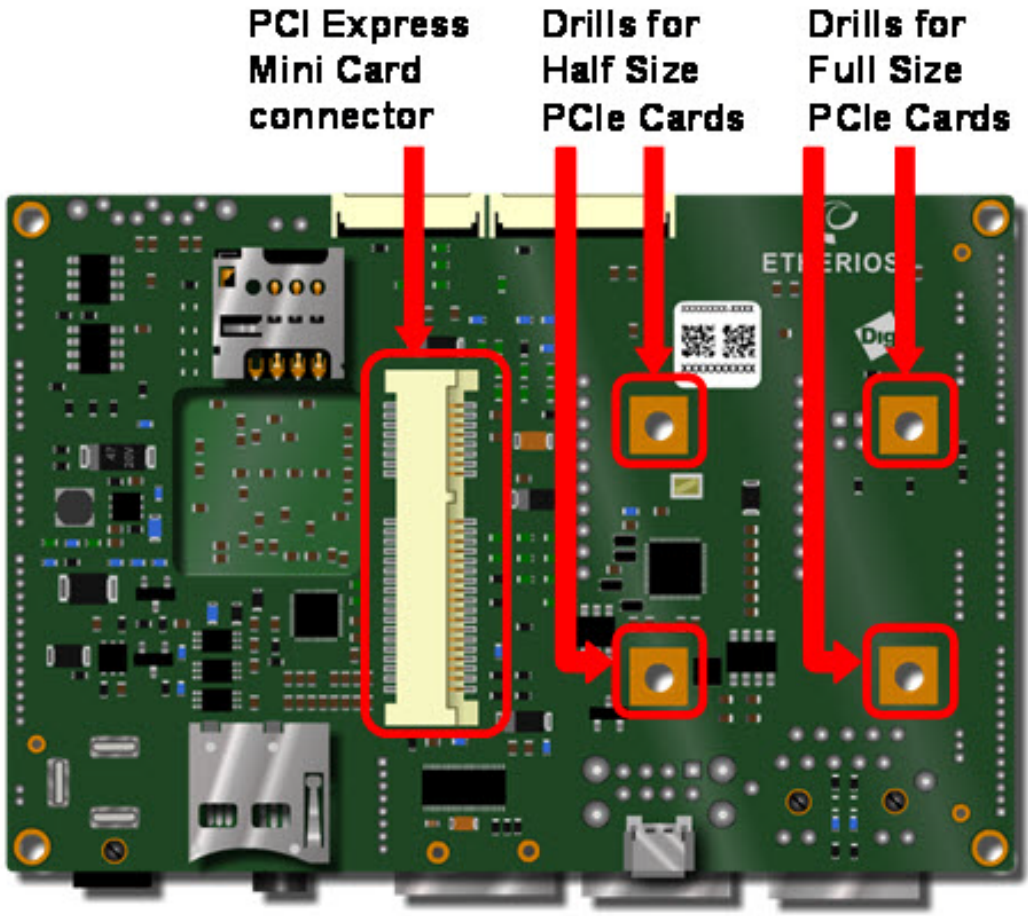
The following table shows the pinout of the dual stackable USB Host connector.

Pin	Signal	Comments
1	USBH1_VBUS	+5V
2	USBH1_DN	
3	USBH1_DP	
4	GND	
5	USBH2_DN	+5V
6	USBH2_DN	
7	USBH2_DP	
8	GND	

The following table shows the pinout of the USB expansion connector.

Pin	Signal	Comments
1	+5V	
2	USBH4_DP	
3	USBH4_DN	
4	USBH4_OC_N	Over current input (low level active)
5	USBH4_PWR_EN	Power enable output
6	GND	

PCI express mini card



The ConnectCore 6 SBC provides a Mini PCI Express connector with the following interfaces:

- PCIe transmission differential data pair
- PCIe reception differential data pair
- PCIe clock differential data pair
- I2C3
- USB Host port (USBH3)
- GPIO signal (GPIO_7_7) for the open drain, low level PCIe Wake up signal
- GPIO signal (GPIO_1_4) for the low level PCIe disable signal
- GPIO signal (GPIO_7_8) for the low level PCIe Reset signal
- SIM interface
- +1.5VDC and +3.3VDC supplies

The ConnectCore 6 SBC has four 2.6mm metalized drills: two for the half size and two for the full size mechanization. These drills have a 5.8mm x 5.8mm area without parts or routes for the screws and nuts. To install a PCI express mini card on the ConnectCore 6 SBC we will need two M2.5 nuts, two M2.5 screws, two 4mm M2.5 spacers and two M2.5 washers.

The following picture shows the ConnectCore 6 SBC with a full size PCI express mini card assembled

The following picture shows the ConnectCore 6 SBC with a half size PCI express mini card assembled.

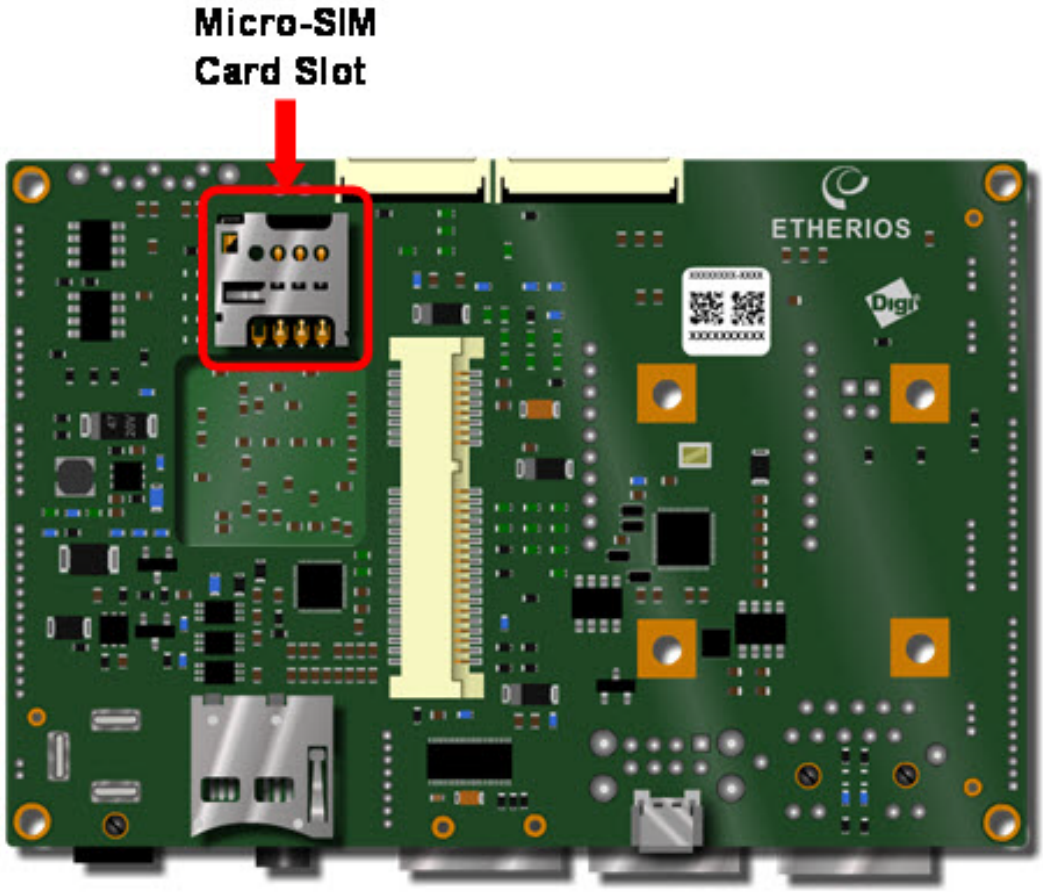
The following table shows the pinout of the PCI express mini card connector.

Pin	Signal	Comments
1	PCIE_WAKE_N	Connected to i.MX6 GPIO_7_7
2	+3.3V	
3	-	
4	GND	
5	-	
6	1.5V	
7	-	
8	PCIE_UIM_PWR	Power supply for SIM card
9	GND	
10	PCIE_UIM_DATA	Data for SIM card
11		
12		Clock for SIM card

Pin	Signal	Comments
13	PCIE_CLK_P	
14	PCI_UIM_RESET	Reset signal for SIM card
15	GND	
16	PCIE_UIM_VPP	Power supply for SIM programming
17	-	
18	GND	
19	-	
20	PCIE_DIS_N	Connected to i.MX6GPIO_1_4
21	GND	
22	PCIE_RESET_N	Connected to i.MX6GPIO_7_8
23	PCIE_RX_N	
24	+3.3V	
25	PCIE_RX_P	
26	GND	
27	GND	
28	+1.5V	
29	GND	
30	I2C3_SCL	
31	PCIE_TX_N	
32	I2C3_SDA	
33	PCIE_TX_P	
34	GND	
35	GND	
36	USBH3_DN	
37	GND	
38	USBH3_DP	
39	+3.3V	
40	-	
41	+3.3V	
42	-	
43	GND	
44	-	
45	-	
46	-	
47	-	

Pin	Signal	Comments
48	+1.5V	
49	-	
50	GND	
51	-	
52	+3.3V	

SBC micro-SIM card slot

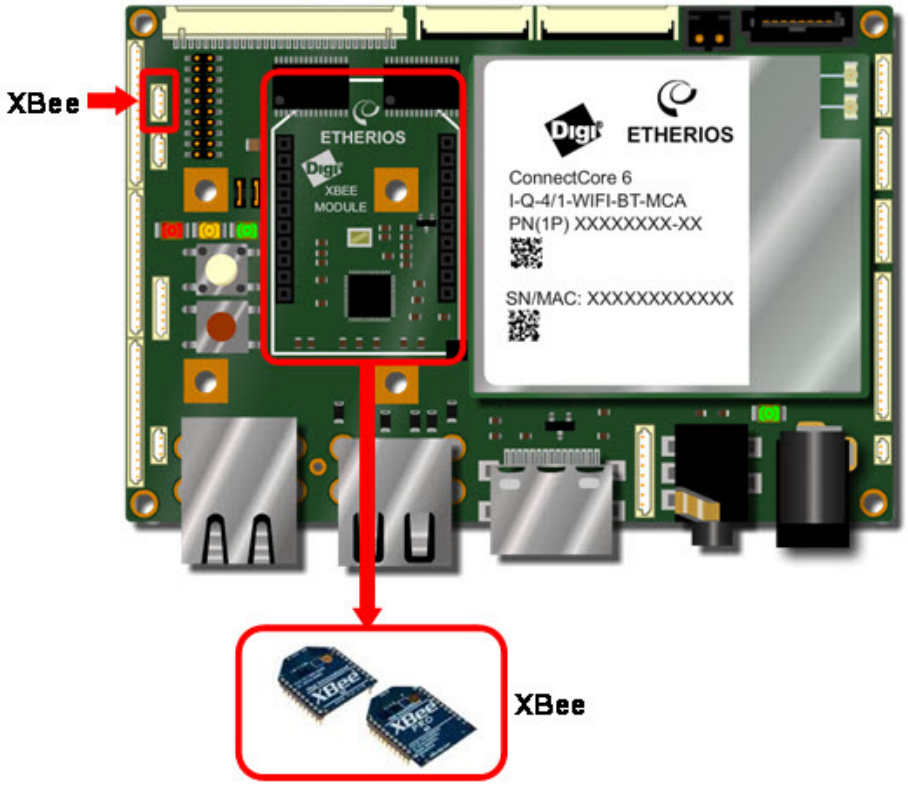


The ConnectCore 6 SBC provides a micro-SIM card slot located on the bottom side of the board. The SIM interface is connected to the PCIe mini card connector enabling a 3G communication when a 3G module is installed in the Mini Card connector. The pinout of the SIM card slot is shown below.

Pin	Signal	Comments
1	PCIE_UIM_PWR	Power supply for SIM card
2	PCI_UIM_RST	Reset signal for SIM card
3	PCIE_UIM_CLK	Clock signal for SIM
4	-	

Pin	Signal	Comments
5	GND	
6	PCIE_UIM_VPP	Power supply for SIM programming
7	PCIE_UIM_DATA	Data signal for SIM card
8	-	

XBee



The ConnecCore6 SBC provides two 10 pin, 2mm pitch connectors to connect a Digi XBee/XBee Pro module. The XBee identification and association signals are connected to a 3pin, 1.25mm pitch expansion connector.

The UART5 port of the ConnectCore 6 module is used to communicate with the XBee module. This UART port is also connected to the UART expansion connector. Only one of the two UART5 interfaces (XBee or Expansion) can be used at a time.

Three GPIO signals of the ConnectCore 6 module are used to reset the XBee, and control the status of the XBee module.

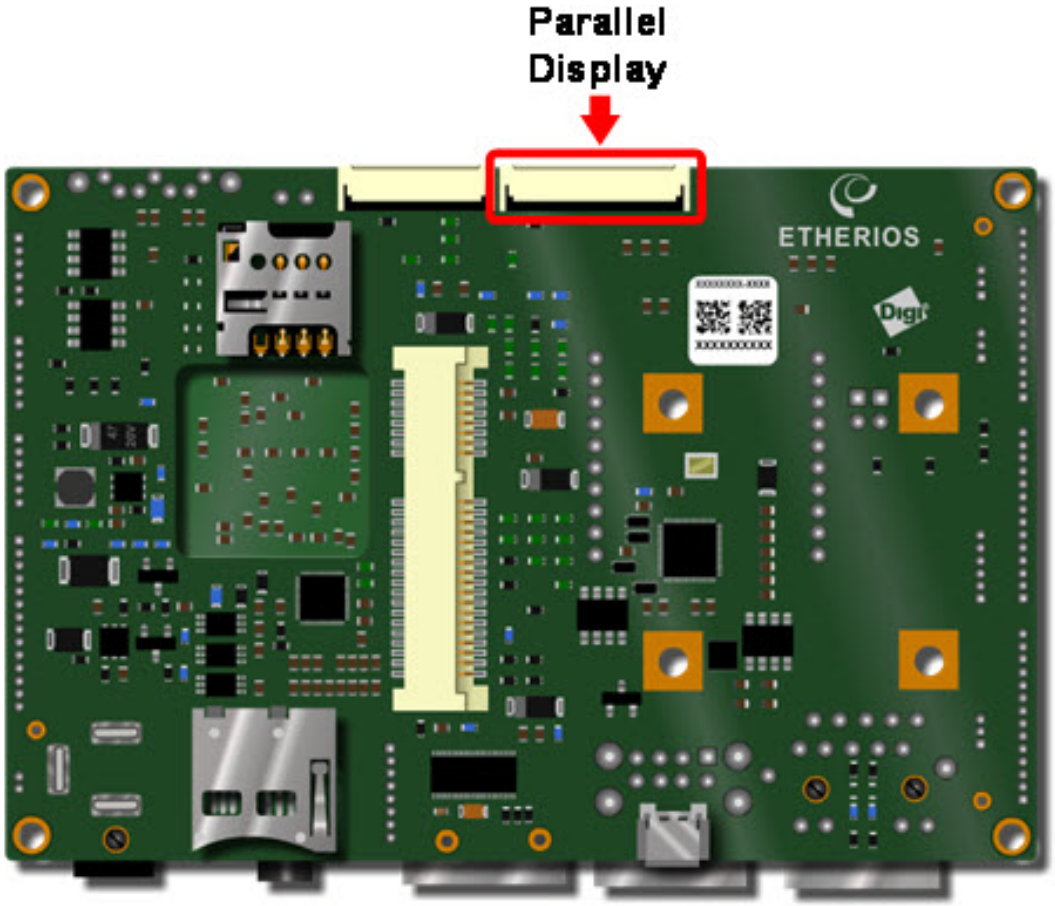
The pinout of the XBee module connectors is shown below.

Pin	Signal	Comments
1	VCC	3.3V supply for the XBee
2	UART5_RX	XBee Data Out
3	UART5_TX	
4		
5	XBEE_RESET_N	Reset signal connected to GPIO_3_28
6		
7		
8		
9	XBEE_SLEEP_RQ	Sleep request signal connected to GPIO_3_29
10	GND	
11		
12	UART5_RTS_N	
13	XBEE_ON/SLEEP_N	Status signal connected GPIO_3_27
14		
15	XBEE_ASSOC	Association signal connected to expansion connector
16	UART5_CTS_N	
17		
18		
19		
20	XBEE_IDENT	Idnet input signal connected to expansion connector

The pinout of the XBee expansion connectors are shown below.

Pin	Signal	Comments
1	XBEE_IDENT	XBee ident input signal
2	XBEE_ASSOC	XBee association output signal
3	GND	XBee Data In

Parallel display



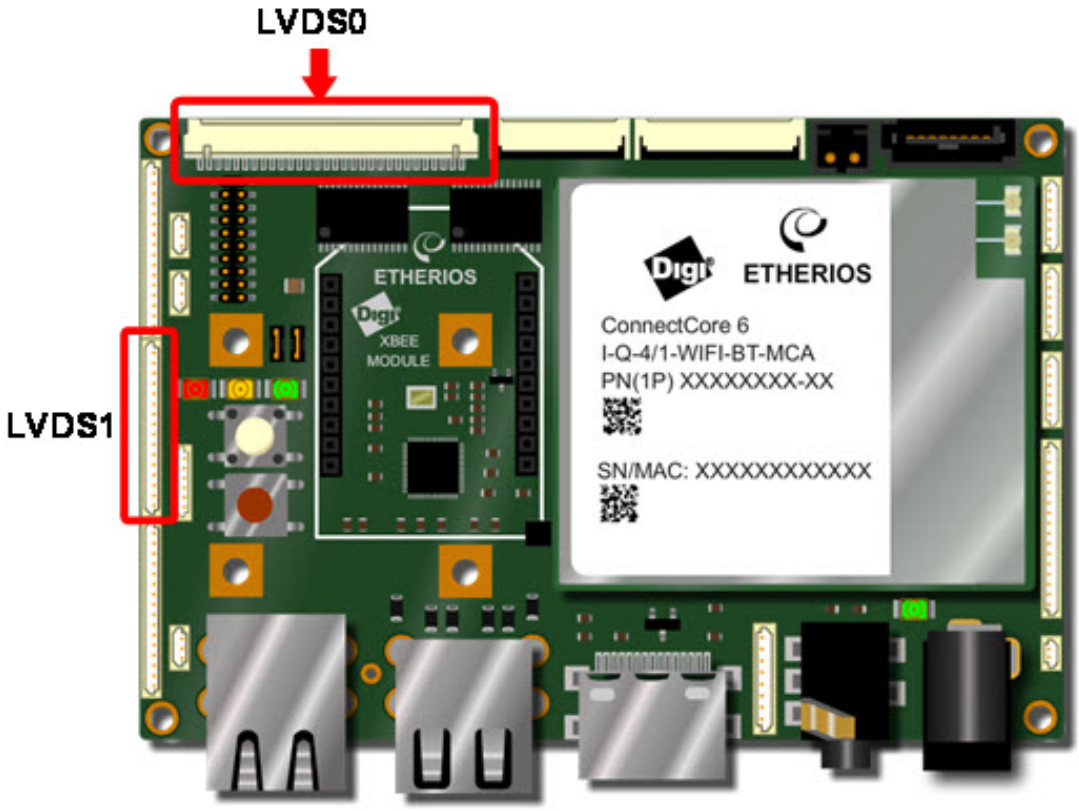
The ConnectCore 6 SBC provides a 24-bit RGB LCD interface connected to a 40pin, 0.5mm pitch, FFC connector. Backlight control signal, I2C port and interrupt line for a touch screen panel are available on the parallel LCD connector. The connector has 3.3V supply for the LCD display and a 5V supply for the LED backlight.

The pinout of the parallel display connectors is shown below.

Pin	Signal	Comments
1	GND	
2	DISP0_DAT0	
3	DISP0_DAT1	
4	DISP0_DAT2	
5	DISP0_DAT3	
6	DISP0_DAT4	
7	DISP0_DAT5	
8	DISP0_DAT6	
9	DISP0_DAT7	
10	DISP0_DAT8	

Pin	Signal	Comments
11	DISP0_DAT9	
12	DISP0_DAT10	
13	DISP0_DAT11	
14	DISP0_DAT12	
15	DISP0_DAT13	
16	DISP0_DAT14	
17	DISP0_DAT15	
18	DISP0_DAT16	
19	DISP0_DAT17	
20	DISP0_DAT18	
21	DISP0_DAT19	
22	DISP0_DAT20	
23	DISP0_DAT21	
24	DISP0_DAT22	
25	DISP0_DAT23	
26	GND	
27	DISP0_CLK	Clock signal for the LCD
28	GND	
29	DISP0_HSYNC	
30	DISP0_VSYNC	
31	DISP0_DRDY	
32	DISP0_CONTRAST	Contrast signal connected to DI0_PIN14 on i.MX6
33	I2C3_SCL	
34	I2C3_SDA	
35	DISP0_IRQ_N	Low level interrupt signal from display
36	GND	
37	3V3	Supply for LCD
38	3V3	Supply for LCD
39	5V	Supply for backlight LEDs
40	5V	Supply for backlight LEDs

LVDS



The ConnectCore 6 SBC provides two LVDS interfaces.

The interface LVDS0 is connected to a 20pin, 1.25mm pitch Hirose DF14 connector. This connector provides access to the following LVDS capabilities:

- 4 LVDS0 differential data pairs
- 1 LVDS0 differential clock pair
- Interrupt signal (GPIO_7_11) with 10K pull-up resistors for touch screen
- PWM output (PMIC_GPIO11) to control the backlight contrast
- I2C3
- +3.3VDC and +5VDC supplies

The following table shows the pinout of the LVDS0 connector.

Pin	Signal	Comments
1	+3.3V	Generated on PMIC buckperi
2	LVDS0 TX0 N	Transmission pair 0 data -
3	LVDS0 TX0 P	Transmission pair 0 data +
4	GND	
5	LVDS0 TX1 N	Transmission pair 1 data -

Pin	Signal	Comments
6	LVDS0 TX1 P	Transmission pair 1 data +
7	GND	
8	LVDS0 TX2 N	Transmission pair 2 data -
9	LVDS0 TX2 P	Transmission pair 2 data +
10	GND	
11	LVDS0 CLK N	Transmission pair clock -
12	LVDS0 CLK P	Transmission pair clock +
13	GND	
14	LVDS0 TX3 N	Transmission pair 3 data -
15	LVDS0 TX3 P	Transmission pair 3 data +
16	LVDS0 CONTRAST	PMIC GPIO11
17	I2C3 SCL	
18	I2C3 SDA	
19	LVDS0 IRQ N	Connected to i.MX6 GPIO 7 11
20	+5V	Generated on SBC board

The interface LVDS1 is connected to a 14pin, 1.25mm pitch, straight expansion connector. This connector provides access to the following LVDS capabilities:

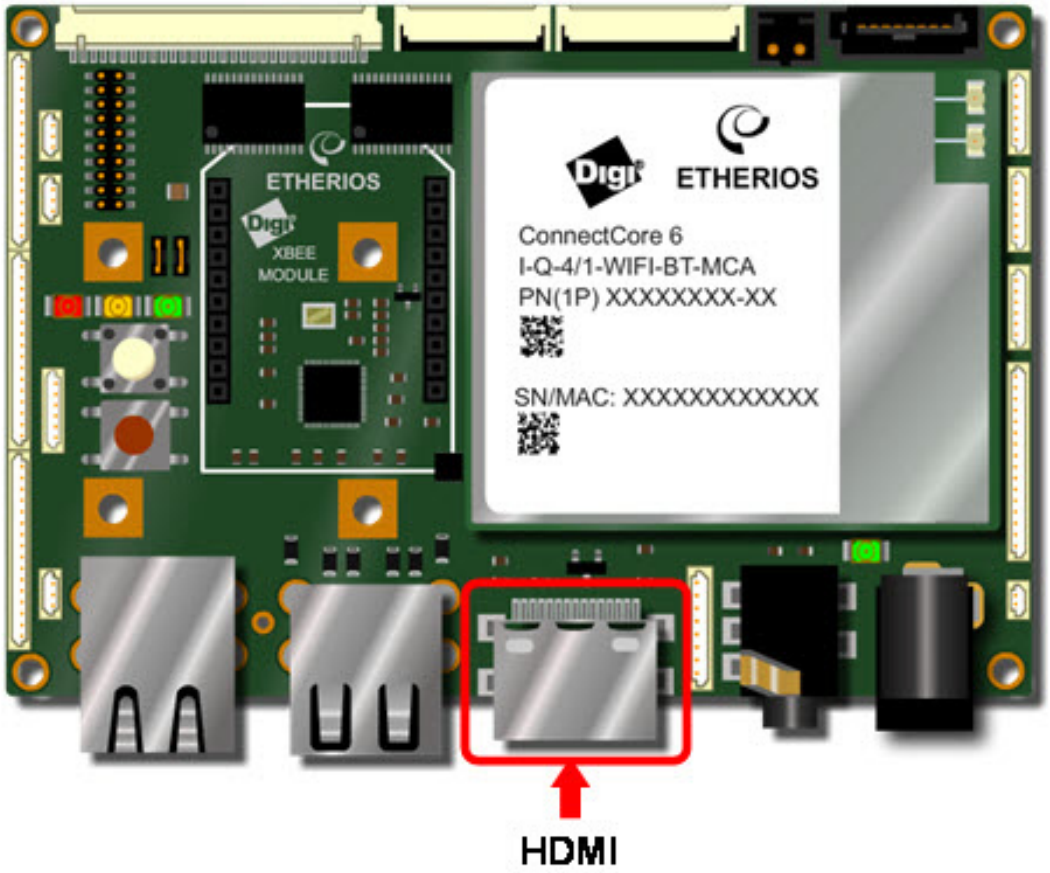
- 4 LVDS1 differential data pairs
- 1 LVDS1 differential clock pair
- Interrupt signal (GPIO_3_23) with 10K pull-up resistors for touch screen
- PWM output (PMIC_GPIO15) to control the backlight contrast

The table below shows the pinout of the LVDS1 expansion connector.

Pin	Signal	Comments
1	LVDS1_TX0_P	Transmission pair 0 data +
2	LVDS1_TX0_N	Transmission pair 0 data -
3	LVDS1_TX1_P	Transmission pair 1 data +
4	LVDS1_TX1_N	Transmission pair 1 data -
5	LVDS1_TX2_ P	Transmission pair 2 data +
6	LVDS1_TX2_N	Transmission pair 2 data -
7	LVDS1_TX3_P	Transmission pair 3 data +

Pin	Signal	Comments
8	LVDS1_TX3_N	Transmission pair 3 data -
9	LVDS1_CLK_P	Transmission pair clock +
10	LVDS1_CLK_N	Transmission pair clock -
11	GND	
12	LVDS1_IRQ_N	Connected to i.MX6 GPIO_3_23
13	LVDS1_CONTRAST	PMIC_GPIO15
14	GND	

HDMI



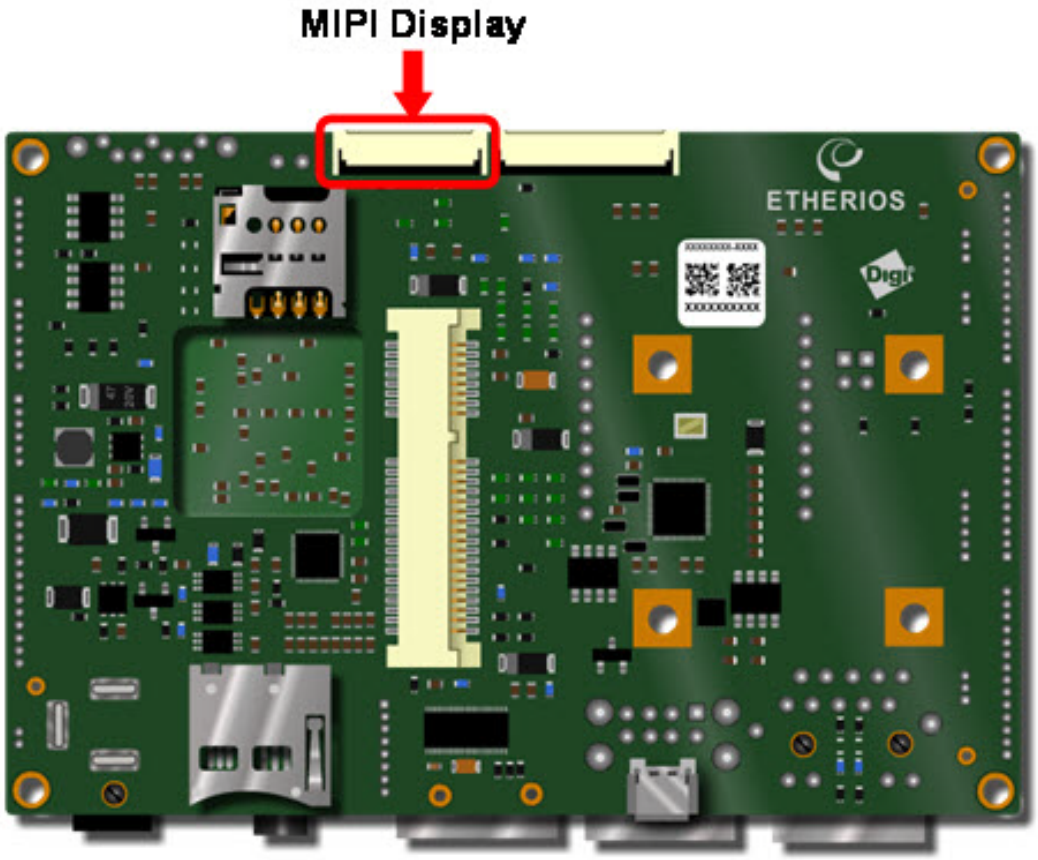
The ConnectCore 6 module provides an HDMI 1.4a compatible interface. The interface includes the HDMI controller and PHY. Video resolutions up to 1080p@120Hz HDTV are supported. All audio formats as specified by the HDMI Specification 1.4a are supported. Hot plug/unplug detection is also supported.

The ConnectCore 6 SBC board provides an HDMI connector for a standard HDMI cable. The HDMI interface includes ESD, overcurrent and backdrive protection.

The table below shows the pinout of the HDMI connector.

Pin	Signal	Comments
1	HDMI_TX2+	Transmission pair 2 data +
2	GND	Data2 shield
3	HDMI_TX2 -	Transmission pair 2 data -
4	HDMI_TX1 +	Transmission pair 1 data +
5	GND	Data1 shield
6	HDMI_TX1 -	Transmission pair 1 data -
7	HDMI_TX0 +	Transmission pair 0 data +
8	GND	Data0 shield
9	HDMI_TX0 -	Transmission pair 0 data -
10	HDMI_TXC +	Transmission pair clock +
11	GND	Clock shield
12	HDMI_TXC -	Transmission pair clock -
13	NC	Consumer Electric Control
14	NC	Reserved
15	HDMI_SCL	I2C SCL
16	HDMI_SDA	I2C SDA
17	GND	DDC/CEC Ground
18	+5V	5V supply (50mA max)
19	HOTPLUG_DET	Hot Plug Detection

MIPI display



The ConnectCore 6 SBC provides a MIPI display serial interface (MIPI_DSI) compliant with the MIPI DSI specification. A MIPI D-PHY is included on the module, allowing direct connections between the module and a MIPI DSI compliant display.

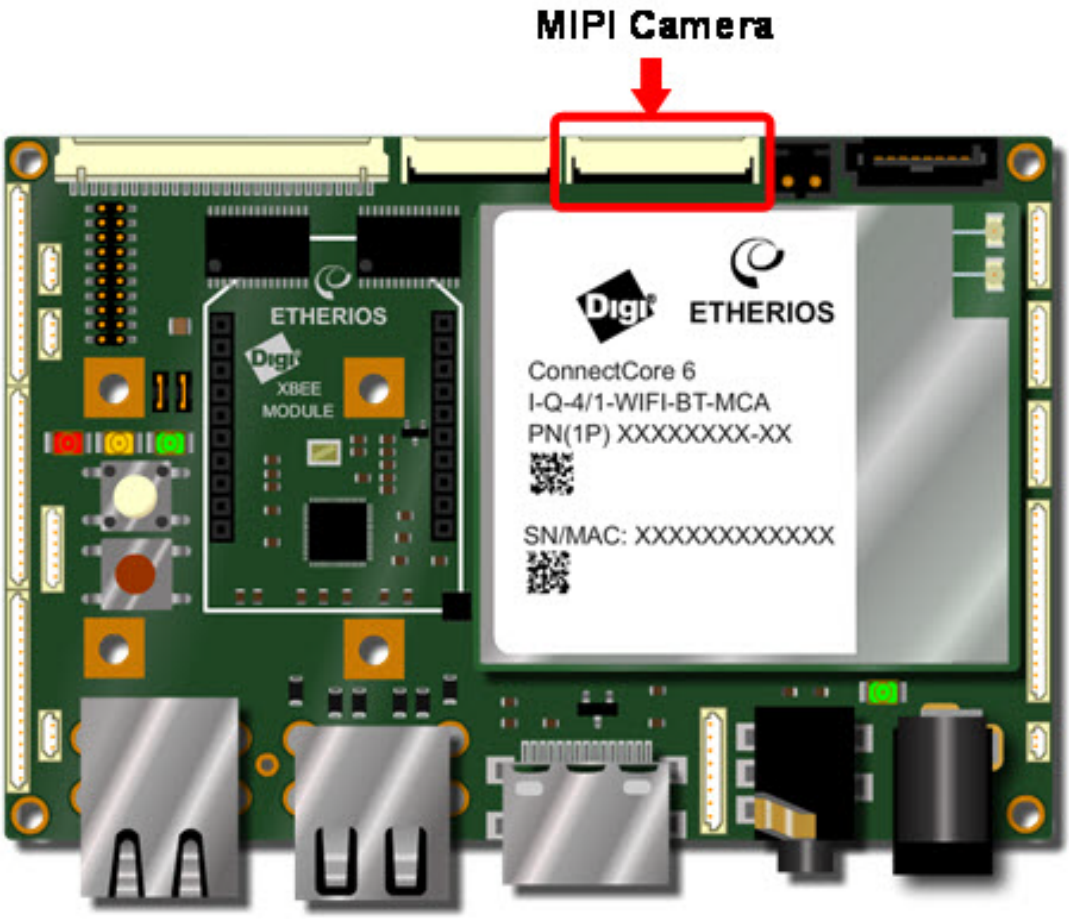
The MIPI CSI signals are connected to a 20pin FFC connector on the bottom side of the ConnectCore 6 SBC. This connector provides access to the following signals:

- 2 MIPI DSI differential data pairs
- 1 MIPI DSI differential clock pair
- I2C3
- Interrupt signal (GPIO_2_27) with 10K pull-up resistors for touch screen
- PWM output (PMIC_GPIO14) to control the backlight contrast
- GPIO signal (GPIO_3_26) for the MIPI Display Reset
- GPIO signal (GPIO_6_31) for the MIPI Power Enable
- +3.3VDC and +5VDC supplies

The table below shows the pinout of the MIPI display connector.

Pin	Signal	Comments
1	+3.3V	Generated on PMIC buckperi
2	+3.3V	Generated on PMIC buckperi
3	DSI_D0_P	MIPI display pair 0 data +
4	DSI_D0_N	MIPI display pair 0 data -
5	GND	
6	DSI_CLK_P	MIPI display pair clock +
7	DSI_CLK_N	MIPI display pair clock -
8	GND	
9	DSI_D1_P	MIPI display pair 1 data +
10	DSI_D1_N +	MIPI display pair 1 data -
11	GND	
12	DSI_D1_N	Connected to i.MX6 GPIO_2_27
13	DSI_CONTRAST	PMIC_GPIO14
14	DSI_RESET_N	Connected to i.MX6 GPIO_3_26
15	DSI_PWR_EN	Connected to i.MX6 GPIO_6_31
16	GND	
17	I2C3_SCL	
18	I2C3_SDA	
19	+5V	Generated on SBC board
20	+5V	Generated on SBC board

MIPI camera



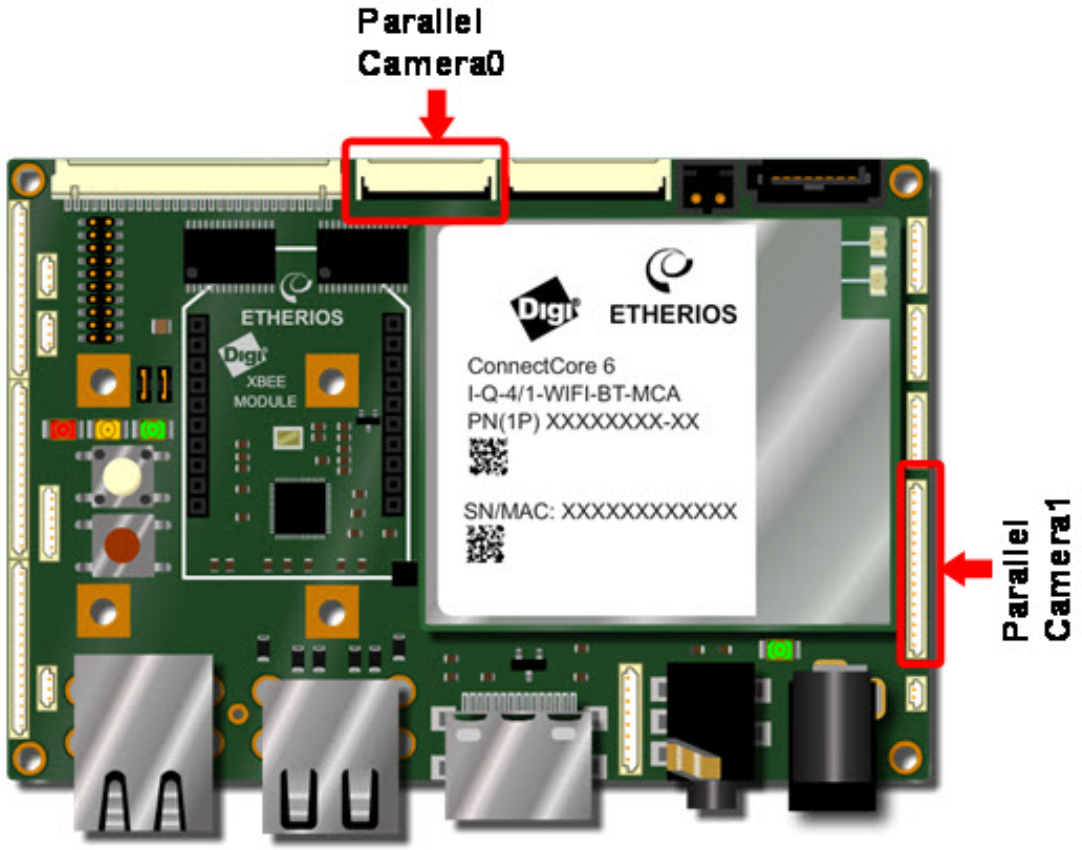
The ConnectCore 6 SBC provides a MIPI camera serial interface (MIPI CSI) compliant with the MIPI CSI-2 specification. A MIPI D-PHY is included on the module, allowing direct connections between the module and a MIPI CSI-2 compliant camera sensor. The MIPI CSI signals are connected to a 24pin FFC connector. This connector provides access to the following signals:

- 4 MIPI CSI differential data pairs
- 1 MIPI CSI differential clock pair
- GPIO signal (GPIO_7_6) for the MIPI Camera Reset
- I2C3
- +5VDC supply

The table below shows the pinout of the MIPI CSI connector.

Pin	Signal	Comments
1	GND	
2	I2C3_SCL	
3	I2C3_SDA	
4	CSI_RESET_N	Connected to i.MX6 GPIO_7_6
5	CSI_D3_P	MIPI CSI pair 3 data+
6	CSI_D3_N	MIPI CSI pair 3 data-
7	CSI_D2_P	MIPI CSI pair 2 data+
8	CSI_D2_N	MIPI CSI pair 2 data-
9	GND	
10	GND	
11	CSI_D0_P	MIPI CSI pair 0 data+
12	CSI_D0_N	MIPI CSI pair 0 data-
13	GND	
14	CSI_CLK_P	MIPI CSI pair clock+
15	CSI_CLK_N	MIPI CSI pair clock-
16	GND	
17	CSI_D1_P	MIPI CSI pair 1 data+
18	CSI_D1_N	MIPI CSI pair 1 data-
19	GND	
20	GND	
21	+5V	Generated on SBC board
22	+5V	Generated on SBC board
23	+5V	Generated on SBC board
24	+5V	Generated on SBC board

Parallel camera



The ConnectCore 6 SBC provides two parallel camera sensor interfaces (CSI). Both interfaces are composed of an 8 bit data bus, a master clock generated by the i.MX6 CPU and three synchronization signals (PIXCLK, HSYNV and VSYNC) generated by the camera sensor.

The first parallel camera interface is connected to a 20 pin FFC connector. This connector provides access to the following signals:

- 8 bit data bus (CSI0_D12 to CSI0_D19)
- Master clock (CSI0_MCLK)
- Pixel clock (CSI0_PIXCLK)
- Horizontal synchronization (CSI0_HSYNC)
- Vertical synchronization (CSI0_VSYNC)
- Camera reset signal (CSI0_RESET_N) connected to GPIO5_0 on the i.MX6 CPU
- I2C3
- GPIO signal (GPIO_5_20)

The table below shows the pinout of the CSI0 connector.

Pin	Signal	Comments
1	GND	
2	CSI0_DAT12	Lowest significant data bit
3	CS10_DAT13	
4	CS10_DAT14	
5	CSI0_DAT15	
6	CSI0_DAT16	
7	CSI0_DAT17	
8	CSI0_DAT18	
9	CSI0_DAT19	Highest significant data bit
10	GND	
11	CSI0_MCLK	
12	CSI0_PIXCLK	
13	CSI0_HSYNC	
14	CSI0_VSYNC	
15	CSI0_GPIO	
16	CSI0_RESET_N	
17	GND	
18	I2C3_SCL	
19	I2C3_SDA	
20	3.3V	

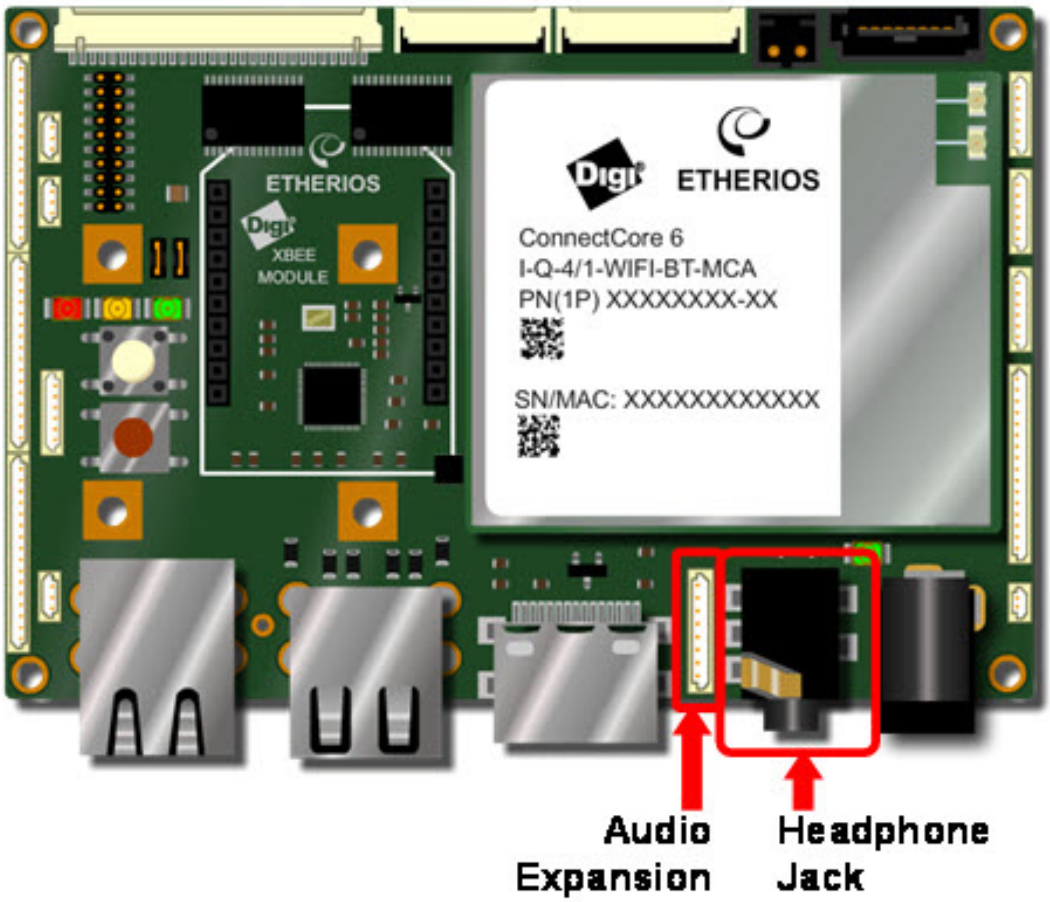
The second parallel camera interface is connected to a 14pin, 1.25mm pitch expansion connector. This connector provides access to the following signals:

- 8 bit data bus (CSI1_D12 to CSI1_D19)
- Master clock (CSI1_MCLK)
- Pixel clock (CSI1_PIXCLK)
- Horizontal synchronization (CSI1_HSYNC)
- Vertical synchronization (CSI1_VSYNC)
- Camera reset signal (CSI1_RESET_N) connected to GPIO3_15 on the i.MX6 CPU

The table below shows the pinout of the CSI1 connector.

Pin	Signal	Comments
1	CSI1_DAT12	Lowest significant data bit
2	CS11_DAT13	
3	CS11_DAT14	
4	CSI1_DAT15	
5	CSI1_DAT16	
6	CSI1_DAT17	
7	CSI1_DAT18	
8	CSI1_DAT19	Highest significant data bit
9	GND	
10	CSI1_MCLK	
11	CSI1_PIXCLK	
12	CSI1_HSYNC	
13	CSI1_VSYNC	
14	CSI1_RESET_N	

Audio



The ConnectCore 6 SBC provides an audio interface with headphone, line-out, line-in, and microphone signals. The Freescale SGTL5000 audio codec is used on the SBC to generate all the audio signals.

The headphone audio signal is connected to a stereo audio jack. The signal GPIO2_0 of the i.MX6 is connected to the audio jack for the headphone detector functionality. When a headphone is connected to the audio jack, the line-out channel will be muted and the CODEC will route the audio output to the headphone. If a headphone is not connected the audio CODEC will connect the audio output to the line-out channel.

The table below shows the pinout of the headphone audio jack.

Pin	Signal	Comments
1	GND	
2	HP_R	Right headphone channel
3	HP_L	Left headphone channel
4	-	
5	HP_DET	Headphone detection

The line in, line out and microphone audio signals are available on an 8 pin, 1.25mm pitch expansion connector. The table below shows the pinout of the audio expansion connector.

Pin	Signal	Comments
1	MIC_BIAS	
2	MIC_IN	
3	LINE_IN_R	
4	LINE_IN_L	
5	GND	
6	LINE_OUT_R	
7	LINE_OUT_L	
8	GND	

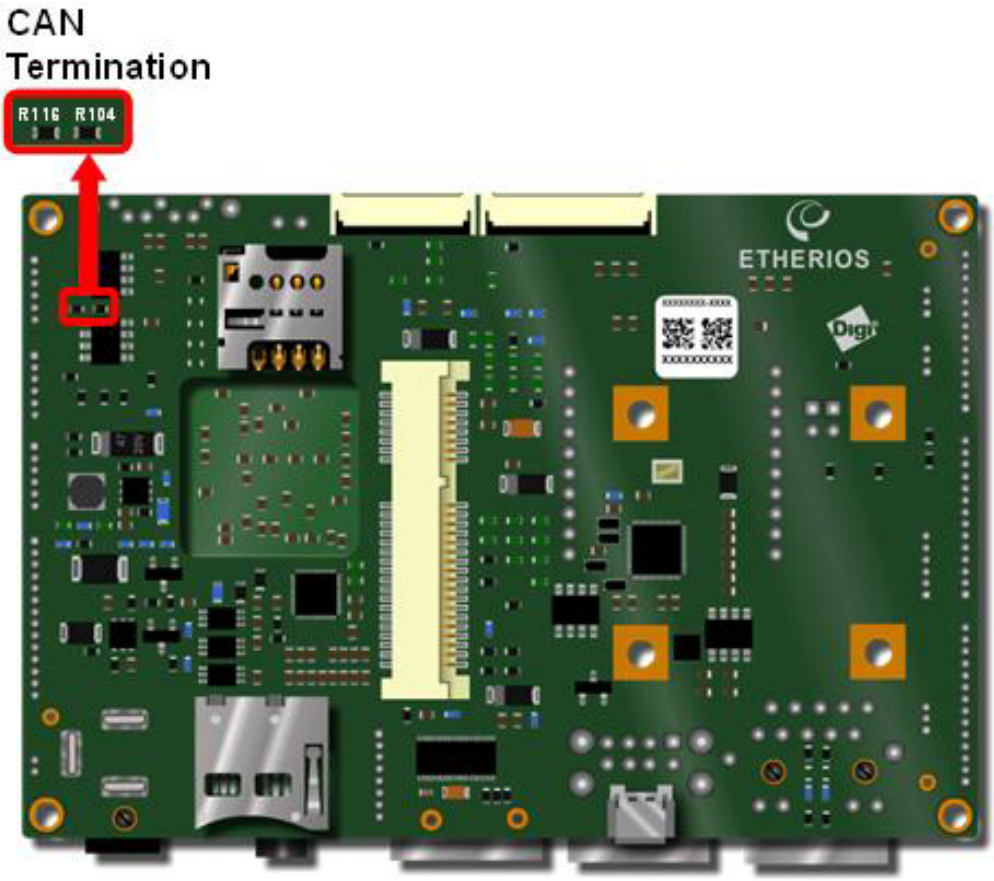
CAN

The ConnectCore 6 SBC provides two CAN bus ports compatible with the CAN 2.0B protocol. Two CAN transceivers are used on the SBC to provide transmit and receive capability between the differential CAN bus and the CAN controller of the i.MX6 CPU. These transceivers allow signal rates up to 1Mbps. The i.MX6 signals GPIO_1_2 and GPIO_1_5 are used to put the CAN1 and CAN2 transceivers on low-power standby mode.

The two CAN ports are available on a 6 pin, 1.25mm pitch expansion connector. The table below shows the pinout of the CAN expansion connector.

Pin	Signal	Comments
1	CAN1_L	
2	CAN1_H	
3	GND	
4	CAN2_L	
5	CAN2_H	
6	GND	

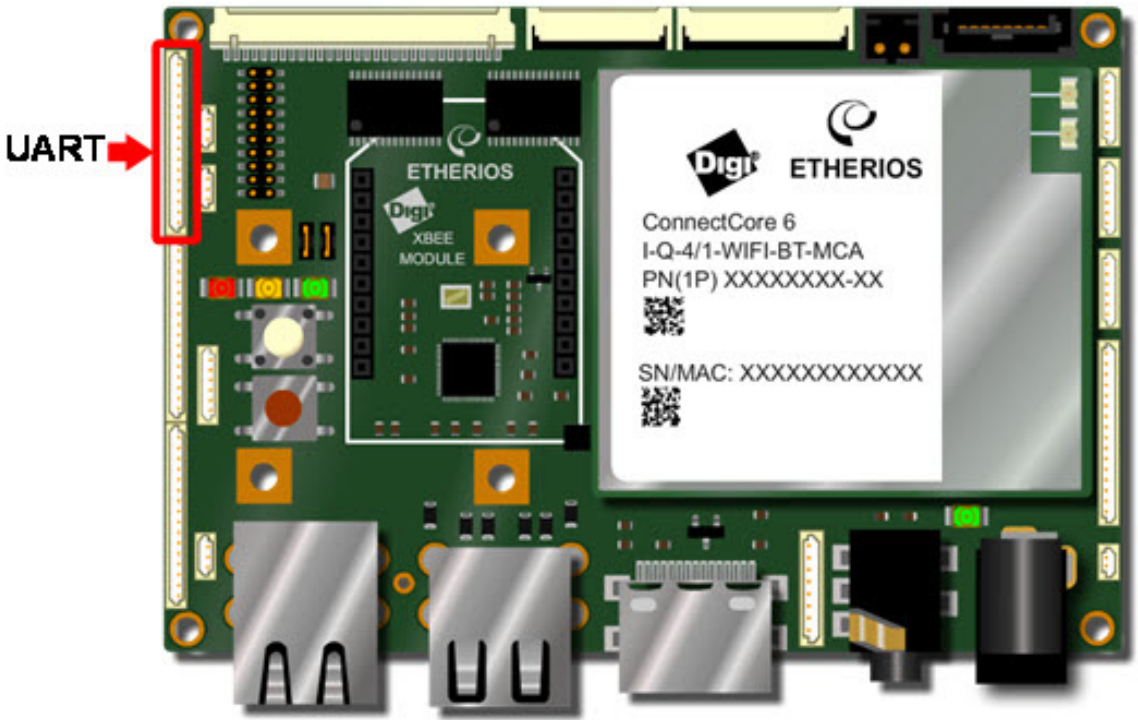
CAN termination resistors



The ConnectCore 6 SBC provides two 120Ω termination resistors on the CAN interfaces. By default these two resistors are populated.

Resistor	Description
R104	CAN1 termination resistor
R116	CAN2 termination resistor

UART



The ConnectCore 6 SBC provides access to three UART interfaces on a 14pin, 1.25mm pitch UART expansion connector. This connector provides access to the following interfaces:

- UART1: 4 wire, RS232 level UART
- UART3: 4 wire, RS232 level UART
- UART5: 4 wire, TTL UART shared with XBee interface

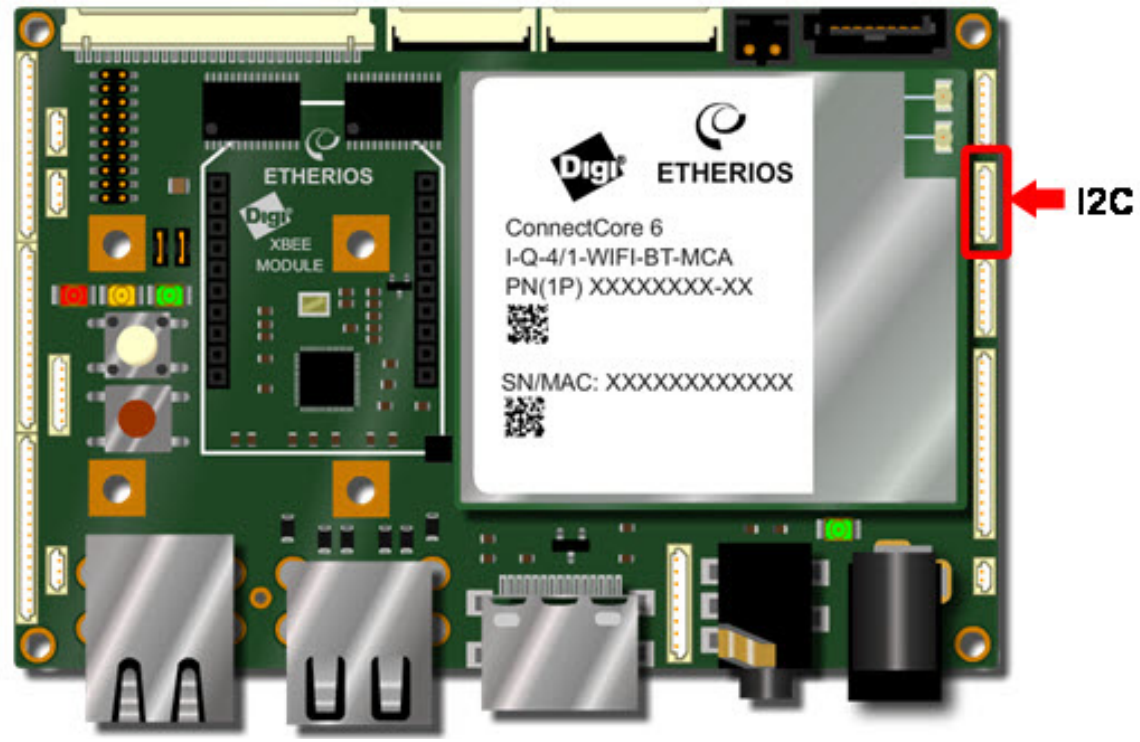
These three UART interfaces have software flow control lines (RTS and CTS). UART1 and UART3 have RS232 levels and they are configured in DTE mode (CTS input and RTS output). The UART5 interface has TTL levels and it is configured in DCE mode (CTS output and RTS input).

The table below shows the pinout of the UART expansion connector.

Pin	Signal	Comments
1	RS232_1_TX	
2	RS232_1_RX	
3	RS232_1_RTS_N	Output from i.MX6
4	RS232_1_CTS_N	Input to i.MX6
5	GND	
6	RS232_3_TX	
7	RS232_3_RX	
8	RS232_3_RTS_N	Output from i.MX6

Pin	Signal	Comments
9	RS232_3_CTS_N	Input to i.MX6
10	GND	
11	UART5_TX	
12	UART5_RX	
13	UART5_RTS_N	Output from i.MX6
14	UART5_CTS_N	Input to i.MX6

I2C



The ConnectCore 6 SBC provides access to the I2C3 interface of the i.MX6 CPU. Two 2K2 pull-up resistors to 3.3V are connected to the I2C3 lines on the SBC.

The I2C3 port is used on the ConnectCore 6 SBC on several interfaces. The following table shows the interfaces connected to the I2C3 bus and their default I2C addresses.

Interface	Speed (Kbps)	Address (7-bit)	Comment
HDMI EDID	100	0x50	Read only accesses
MIPI Camera	-	-	Address depends on the camera used
MIPI Display	-	-	Address depends on the display used
CSI0 Camera	-	-	Address depends on the camera used

Interface	Speed (Kbps)	Address (7-bit)	Comment
CSI1 Camera	-	-	Address depends on the display used
PCIe mini card	-	-	Address depends on the camera use
LVDS EDID	100	0x50	Read only accesses
Touch controller	-	-	Address depends on the touch used
Audio CODEC	400	0x0A	Address of SGTL5000
I2C expansion	-	-	Address depends on the device connected

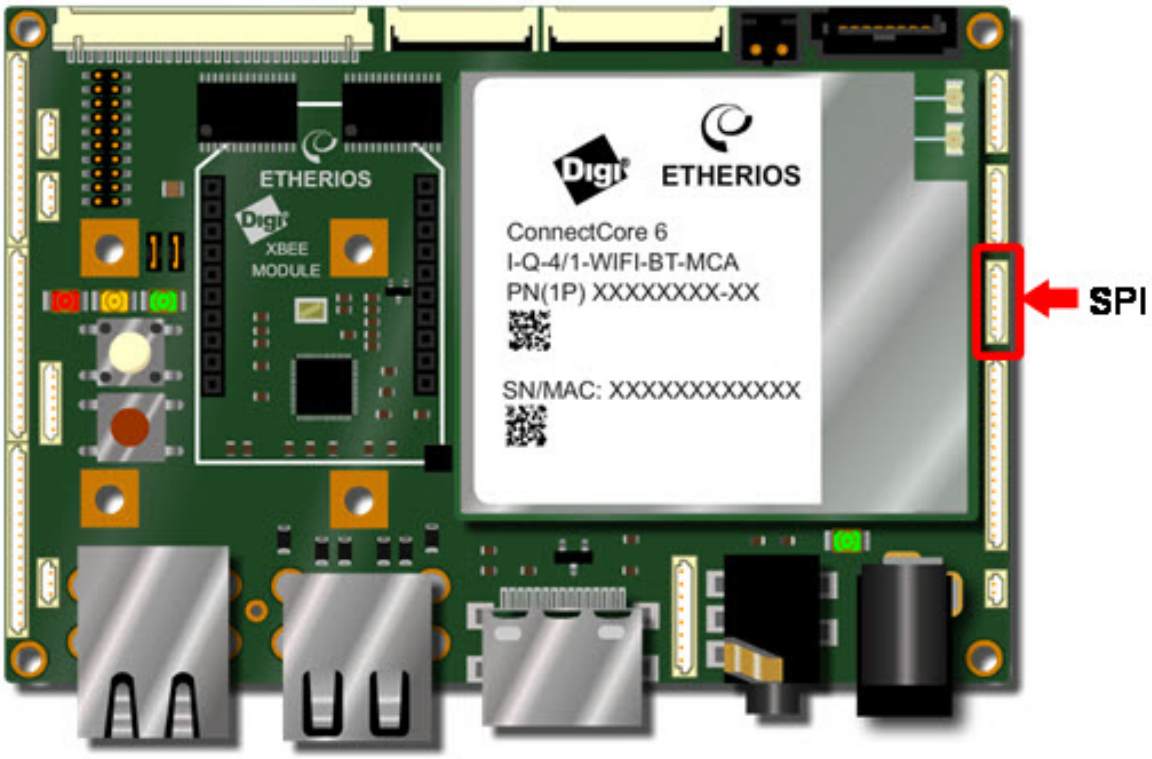
The I2C3 port is connected to a 6 pin, 1.25mm pitch expansion connector. This connector provides access to the following signals:

- I2C3 port
- Interrupt signal connected to GPIO_6_15
- GPIO_6_16 signal

The table below shows the pinout of the I2C expansion connector.

Pin	Signal	Comments
1	I2C3_SCL	
2	I2C3_SDA	
3	GND	
4	I2C3_IRQ_N	10K pull-up to 3.3V on the SBC
5	I2C3_GPIO	
6	GND	

SPI



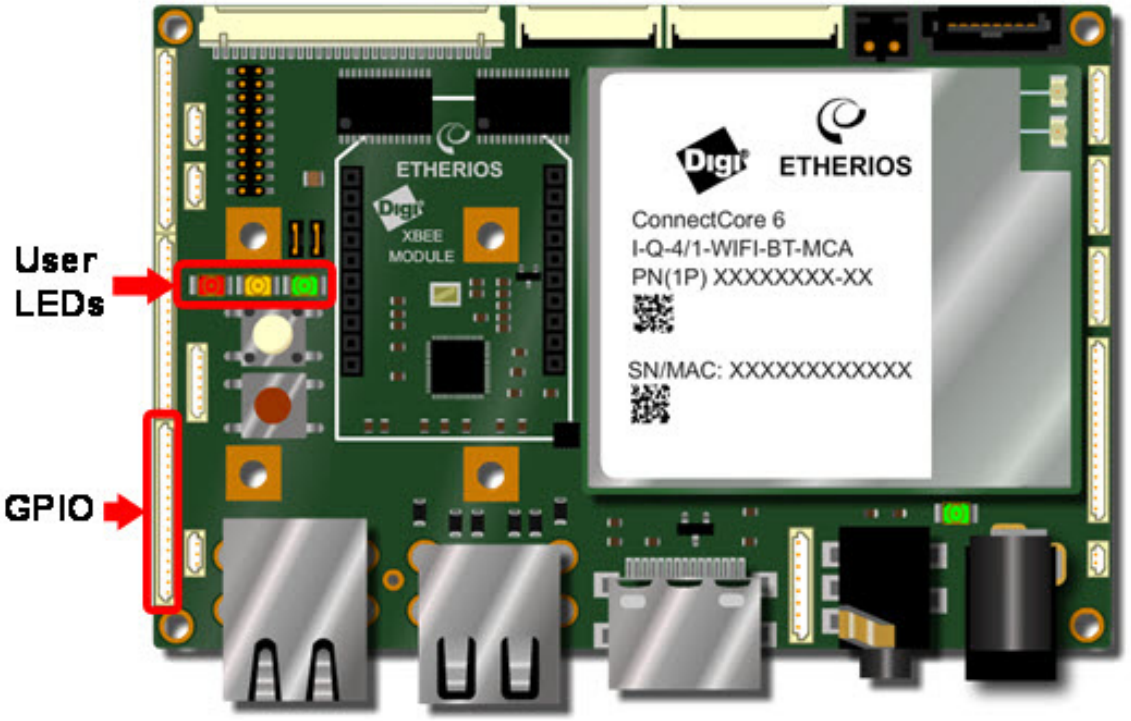
The ConnectCore 6 SBC provides an SPI interface, accessible through a 6 pin, 1.25mm pitch expansion connector. This connector provides access to the following signals:

- SPI1 interface
- One slave select signal (SPI_SS0)
- GPIO_4_10. This signal can be used as interrupt input or as SPI_SS1.

The table below shows the pinout of the SPI expansion connector.

Pin	Signal	Comments
1	SPI1_CLK	
2	SPI1_MISO	
3	SPI1_MOSI	
4	SPI1_SS0	
5	SPI1_SS1/SPI1_IRQ_N	10k pull-up to 3.3V on SBC
6	GND	

GPIO and user LEDs



The table below shows the default GPIO assignment done on the ConnectCore 6 SBC.

Signal Name	GPIO
AUD_HP_DET	GPIO_2_0
CAN1_STBY	GPIO_1_2
CAN2_STBY	GPIO_1_5
CSI_RESET_N	GPIO_7_6
CSI0_GPIO	GPIO_5_20
CSI0_RESET_N	GPIO_5_0
CSI1_RESET_N	GPIO_3_15
DISP0_IRQ_N	GPIO_2_1
DSI_IRQ_N	GPIO_2_27
DSI_PWR_EN	GPIO_6_31
DSI_RESET_N	GPIO_3_26
EXP_GPIO_3	GPIO_2_24
EXP_GPIO_4	GPIO_2_28
EXP_GPIO_5	GPIO_2_29

Signal Name	GPIO
EXP_GPIO_6	GPIO_7_13
EXP_GPIO_7	GPIO_4_5
EXP_I2C_GPIO	GPIO_6_16
EXP_I2C_IRQ_N	GPIO_6_15
EXT_GPIO_0	GPIO_2_5
EXT_GPIO_1	GPIO_2_6
EXT_GPIO_2	GPIO_2_7
LVDS0_IRQ_N	GPIO_7_11
LVDS1_IRQ_N	GPIO_3_23
PCIE_DIS_N	GPIO_1_4
PCIE_RESET_N	GPIO_7_8
PCIE_WAKE_N	GPIO_7_7
PWR_EN	PMIC_GPIO7
RGMII_INT_N	GPIO_1_28
RGMII_RESET_N	GPIO_1_25
SPI1_IRQ_N	GPIO_4_10
USB_HUB_RESET_N	GPIO_3_10
USER_LED0	GPIO_2_2
USER_LED1	GPIO_2_3
USER_LED2	GPIO_2_4
XBEE_ON/SLEEP_N	GPIO_3_27
XBEE_RESET_N	GPIO_3_28
XBEE_SLEEP_RQ	GPIO_3_29

The ConnectCore 6 SBC provides a 14pin, 1.25mm pitch expansion connector with eight digital GPIO signals of the i.MX6 CPU and four digital/analog configurable GPIO signals from the Kinetis MCA. The following table shows the pinout of the expansion GPIO connector.

Pin	Signal	Comments
1	TOUCH_X1	MCA_IO0
2	TOUCH_X2	MCA_IO2
3	TOUCH_Y1	MCA_IO4
4	TOUCH_Y2	MCA_IO9
5	GND	
6	EXP_GPIO_0	
7	EXP_GPIO_1	
8	EXP_GPIO_2	
9	EXP_GPIO_3	
10	EXP_GPIO_4	
11	EXP_GPIO_5	
12	EXP_GPIO_6	
13	EXP_GPIO_7	
14	GND	

The ConectCore6 SBC provides three User LEDs controlled with three GPIO signal. The color of each user LED is different. The following table shows the GPIO associated to each user LED.

LED	Signal	Comments
USER_LED0	GPIO_2_2	Red LED
USER_LED1	GPIO_2_3	Yellow LED
USER_LED2	GPIO_2_4	Green LED

Electrical specifications

The following table shows the voltage range of the input supplies of the ConnectCore 6 SBC.

Supply voltages

Signal	Description	Min.	Typ.	Max.	Unit
DC-In	Main DC supply	4.2	5	5.5	V
VCC_LICELL	Supply for RTC	2.0	3.0	5	V

The following table shows the voltage and current specification of the supply signals generated on the ConnectCore 6 SBC.

Signal	Voltage	Current
3.3V	3.3V	1500mA
5V	5V	1200mA

Note 3.3V supply is used on the module to supply some CPU controllers. Depending on the interfaces configuration the available current may be lower than the one shown on the previous table.

Power consumption

The power consumption of the ConnectCore 6 SBC depends on the modes of operation and the use-cases that the system is running.

Three modes of operations are defined for the ConnectCore 6 SBC:

Power Mode	Description
Normal	Normal operating state. User interfacing with the device.
Sleep	The CPU is idle, no threads are running and most of peripherals are turned off. The system can wake up by means of the configured hardware wake-up source.
Power down	The PMIC and the CPU are switched off and only the RTC and the power button interfaces are enabled.

When the board is in normal mode, the use-case used on the board (number of CPU cores, number and type of interfaces used and number and type of applications running on the board) will highly affect to the power consumption. To show a power consumption reference value for different power scenarios we have select the following use-cases:

Use-case	Description
Non-multimedia	USB to eMC file transfer
Audio playback	MP3 Audio Playback
Video playback	Video playback, 1080p on HDMI LCD Video playback, 1080p on LVDS LCD
Graphics	3DMARK gaming benchmark on HDMI LCD
CPU	Quad core at 100% load Dual core at 100% load Single core at 100% load

Note All use-cases have the following interfaces enabled: console port, Ethernet, USB Host, USB OTG and Micro-SD.

The table below shows the ConnectCore 6 SBC power consumption measurements for the different power modes and use-cases. All measurements are taken at room temperature of 25C using Android operating system. The data shown on the table below are based on empirical measurements on a small sample size.

Power Configuration	Power Supply	Current Draw	Power Consumption
Power down	5V	TBD	TBD
Sleep	5V	TBD	TBD
Non-multimedia	5V	TBD	TBD
Audio playback	5V	TBD	TBD
Video playback HDMI	5V	TBD	TBD
Video playback LVDS	5V	TBD	TBD
Graphics HDMI	5V	TBD	TBD

Power Configuration	Power Supply	Current Draw	Power Consumption
CPU Quad	5V	TBD	TBD
CPU Dual	5V	TBD	TBD
CPU Single	5V	TBD	TBD

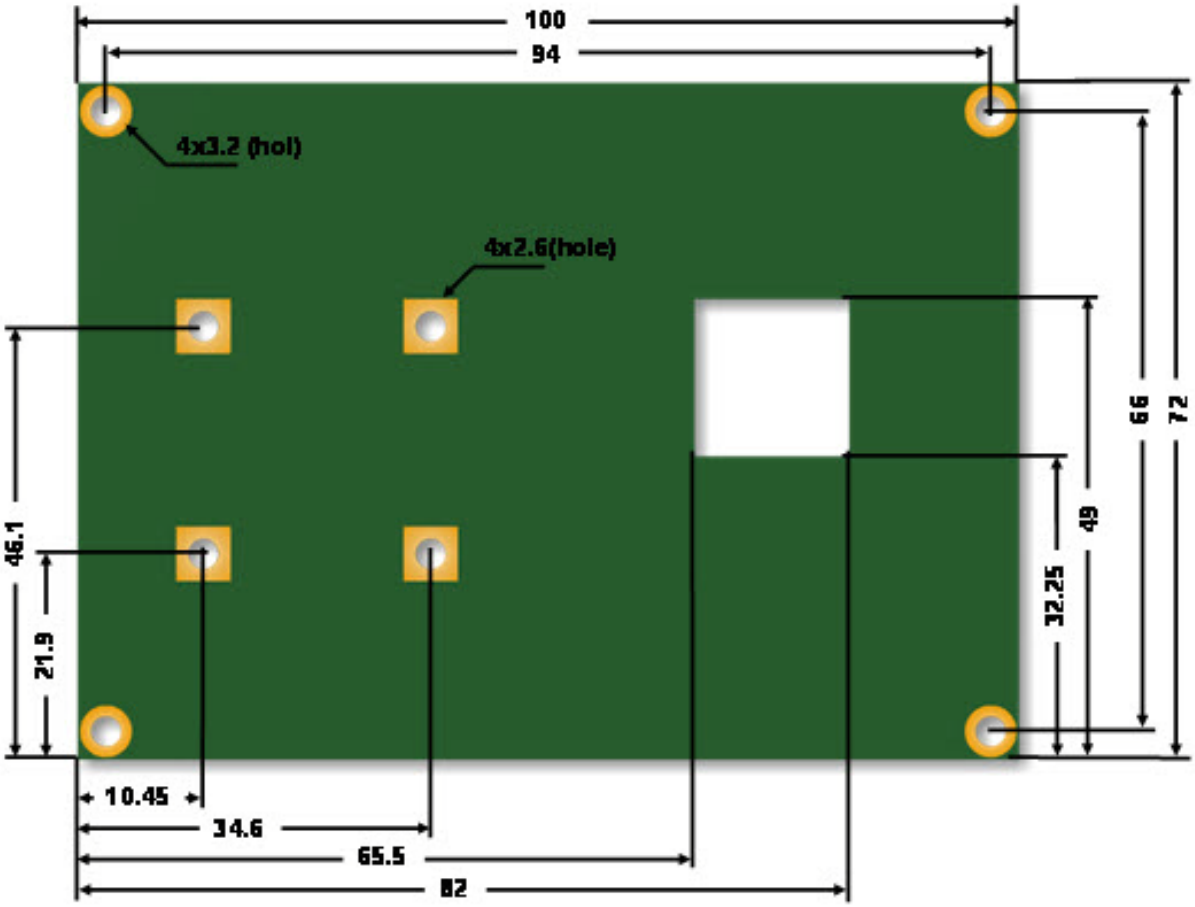
Mechanical specifications

The ConnectCore 6 SBC is a 100mm x 72mm pico-ITX board.

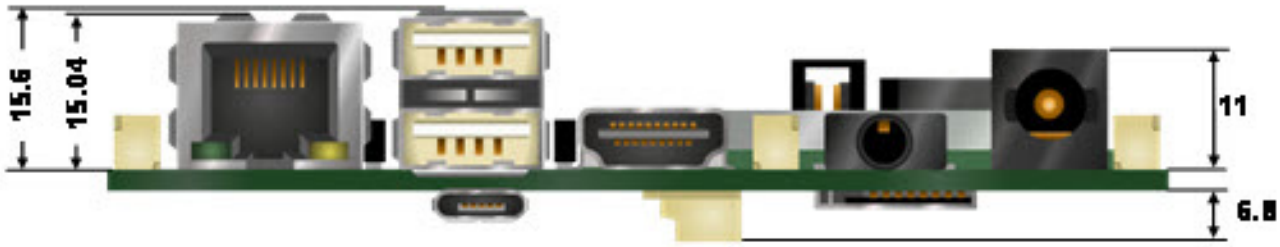
Four 3.2mm drills are located on the four corners of the PCB for assembling the board into an enclosure. These drills have a 5.5mm round metalized area for the screws and nuts.

The board has four 2.6mm drills to assembly a half size or a full size PCI express mini card module. These drills have a 5.8mm x 5.8mm square metalized area for the screws and nuts.

There must be a recess in the board to accommodate the components on the bottom side of the SOM. All dimensions on the following pictures are in millimeters.



The maximum component height on the top side of the ConnectCore 6 SBC is 15.6mm. The maximum component height on the bottom side of the ConnectCore 6 SBC is 6.8mm.



Environmental specifications

The operating temperatures defined for the ConnectCore 6 SBC depends on the ConnectCore 6 module variant.

Specification	Operating Temperature
Industrial	-20°C to +85°C
Commercial	0°C to +70°C

WLAN specifications

For a complete WLAN specification please refer to the ConnectCore 6 module hardware reference manual.

Bluetooth specifications

For a complete Bluetooth specification please refer to the ConnectCore 6 module hardware reference manual.