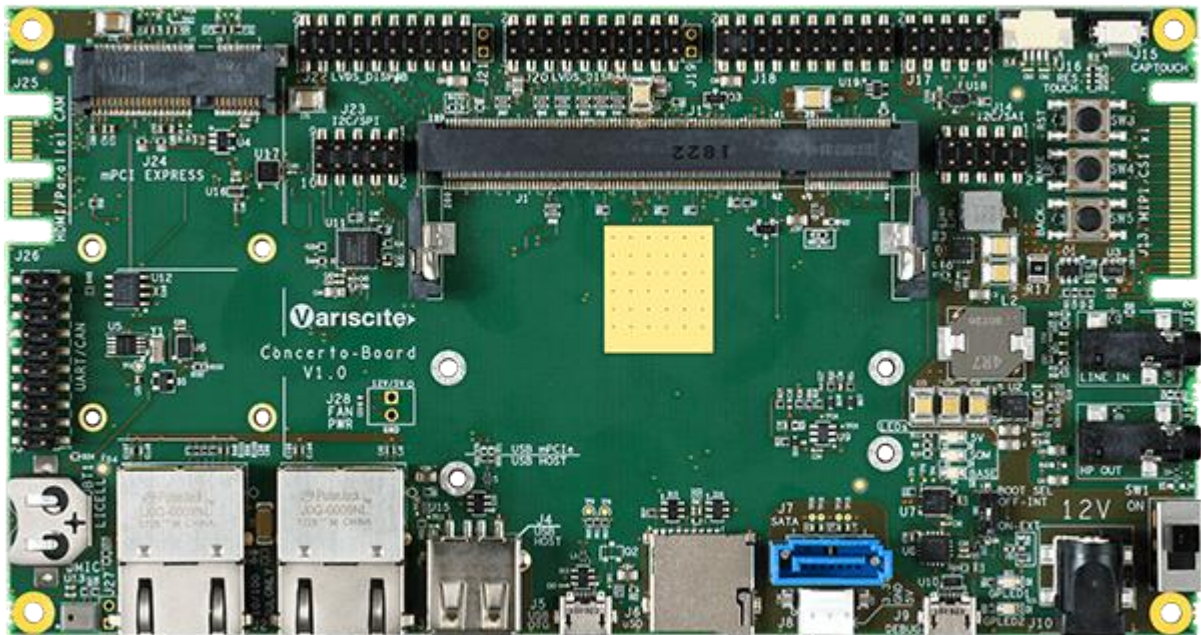**VARISCITE LTD**

Concerto-Board Datasheet
Carrier-board for the VAR-SOM-6UL/SOLO/DUAL V 1.x

VARISCITE LTD.

Concerto-Board Datasheet

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Revision History

Revision	Date	Notes
1.00	Jun 10, 2019	Initial

Table of Contents

List of Tables

1 Overview

1.1 General Information

The Concerto-Board is a complete development board, utilizing all of the VAR-SOM-6UL/SOLO/DUAL System-on-Module's features. It is assembled with large variety of user and debug interfaces enabling it to serve as both a complete development kit or as a stand-alone end-product. VAR-SOM-MX6 compatibility exist but is not part of this documentation.

1.1.1 Supporting Variscite products

- VAR-SOM-6UL
- VAR-SOM-SOLO/DUAL
- 7" Capacitive touch LCD

1.1.2 Supporting O.S

- Linux
- Android

1.1.3 Additional information

Board schematics as well as mechanical CAD data base is available to download at www.variscite.com,

SW support information can be found: http://variwiki.com/

For further information contact Variscite support at mailto:support@variscite.com.

1.2 Concerto-Board features summary

- SO-DIMM200 socket, compatible with the VAR-SOM-6UL/SOLO/DUAL

- Display
  - 2x 18-bit LVDS Interface supporting Variscite's 7" TFT capacitive touch LCD
  - HDMI 2.0a (Via Extension Card)

- Touch panel interface
  - Capacitive - I2C based
  - Resistive – SPI based

- Ethernet
  - 10/100/1000BaseT – RJ45
  - 10/100BaseT – RJ45

- PCIe
  - Mini PCIe

- SATA
  - uSATA connector

- USB
  - USB2.0 OTG Type C
  - USB2.0 Host Type A

- AUDIO
  - 3.5mm Headphones jack
  - 3.5mm Line in jack
  - Digital Microphone

- μSD-Card slot

- Camera
  - Serial interface – MIPI CSI x4 lanes (Via Extension Card)

- CAN Bus
  - CAN Transceiver with CAN FD support via Header

- Debug
  - USB debug - Type Micro AB

- RTC
  - ISL12057 Chip

- Additional
  - UART, PWM, SAI (Serial Audio Interface), SPI, I2C, GPIOs - Headers
  - General purpose LED, Buttons

- Power

- o 12V DC Input. - 2.0mm DC jack / 2 pin Terminal Block
- o 5V,3.3V DC Out – 2 pin Header SATA Power
- o 5V, DC Out – 2 pin Header FAN Power
- o RTC Backup battery - CR1225 Battery Holder

1.3 Block Diagram

1.3.1 Concerto-Board (VAR-SOM-6UL assembled)
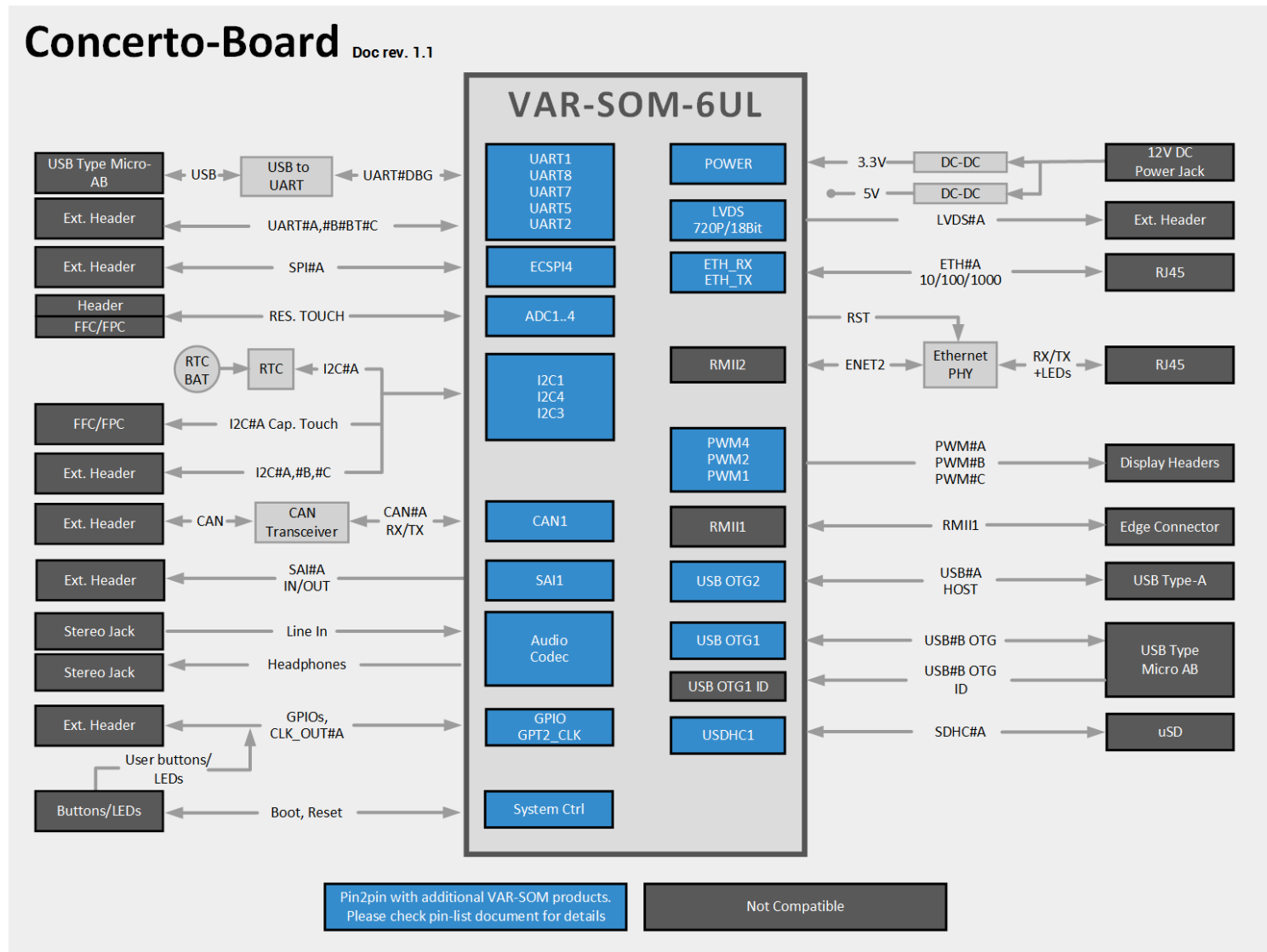
1.3.2 Concerto-Board (VAR-SOM-SOLO/DUAL assembled)
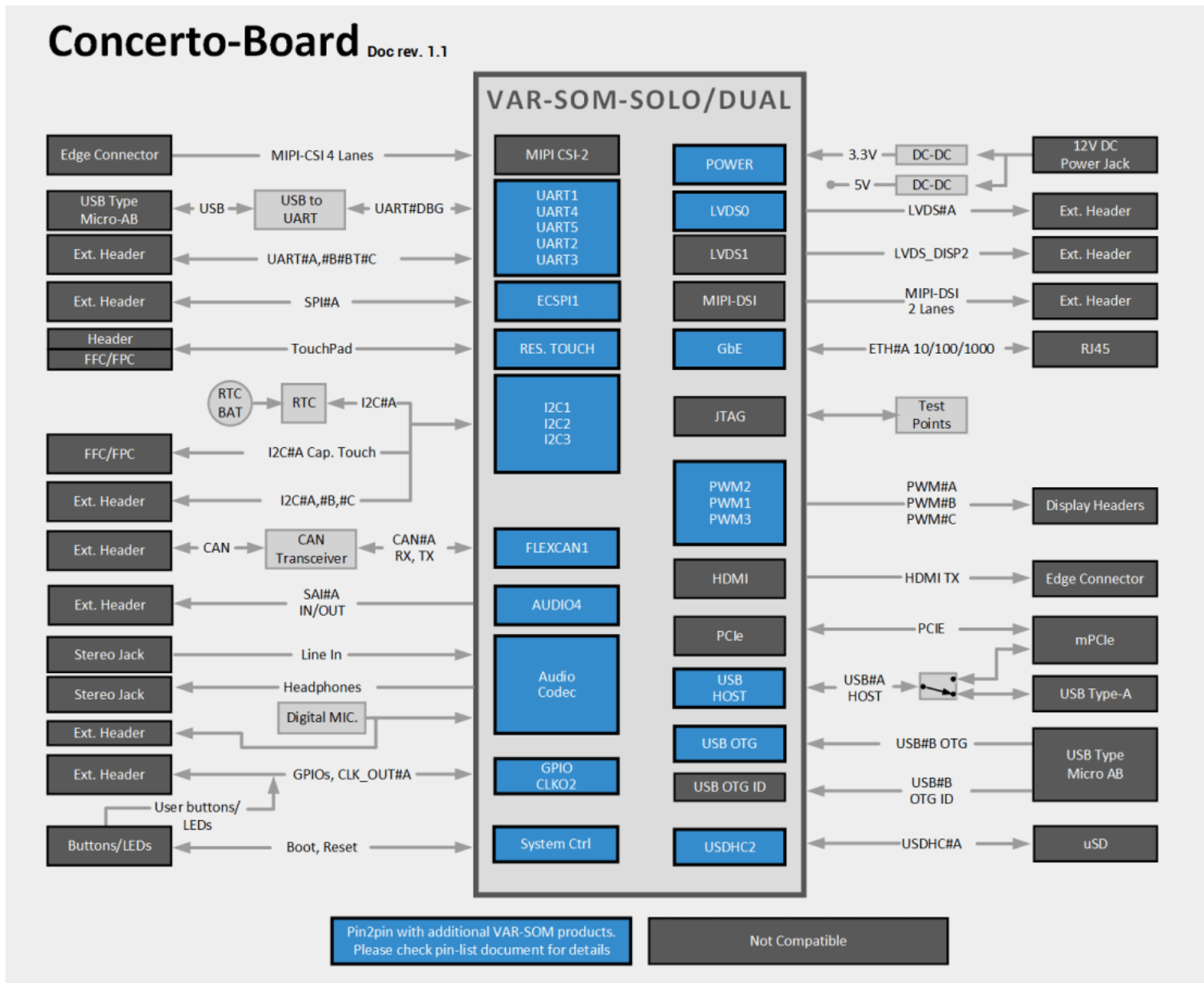
1.4 Board Layout

The Concerto-Board's physical dimensions are 170 x 90 mm.
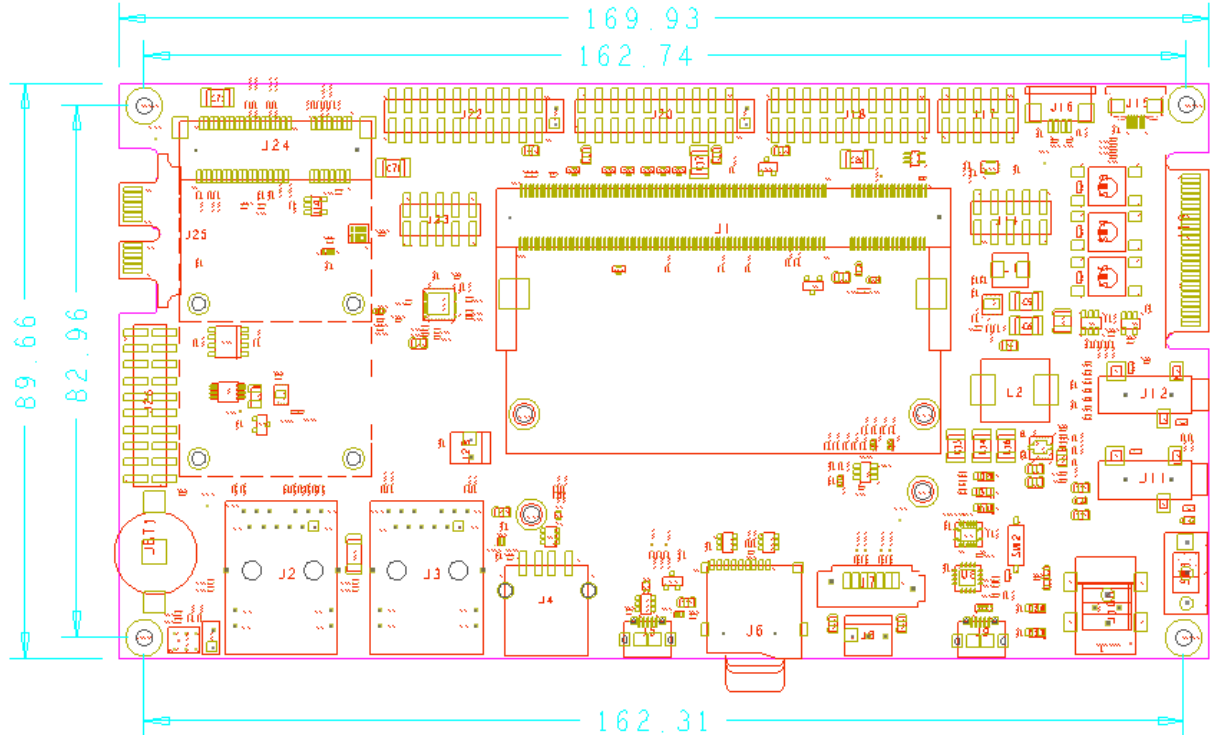
Detailed CAD files are available for download at www.variscite.com.

1.5 Concerto-Board connectors

The below table lists all available connectors on the Concerto-Board,
Refer to chapter 2 for a more detailed description and Pin-out of each connector.

Table 1-1 Concerto-Board connectors

Reference	Function	Type
J1	SOM connection	SO-DIMM 200 Pin Connector
J2	10/100Mbps ETH2 Port (VAR-SOM-6UL)	RJ-45
J3	10/100/1000Mbps ETH1 Port	RJ-45
J4	USB 2.0 Host	USB 2.0 Type A
J5	USB 2.0 OTG	USB Type C
J6	SD-MMC	uSD Connector
J7	SATA 2.0 (VAR-SOM-MX6)	uSATA Connector
J8	SATA Power (VAR-SOM-MX6)	Header 3 position, 2.54mm shrouded
J9	USB Debug	USB Type micro AB
J10	Power In	DC In Jack 2.0 mm
J100	Power In	2 Pin Terminal Block
J11	Headphones	Audio Jack 3.5 mm
J12	Line In	Audio Jack 3.5 mm
J13	MIPI-CSI 4 lanes (Single Camera)	Edge Connector mates to HSEC8-130-01-SM-DV-A
J14	SAI/I2C	Header SMT, 5x2, 2.54mm
J15	Capacitive Touch Panel I/F	FFC/FPC 6-pin
J16	Resistive Touch I/F	FFC/FPC 4-pin
J17	Resistive Touch I/F, GPIO	Header SMT, 5x2, 2.54mm
J18	MIPI-DSI 2 lanes, SPI2 (6UL)	Header SMT, 10x2, 2.54mm
J19	LVDS#A (Data pair 3)	Header TH, 2x1, 2.54mm
J20	LVDS#A (Clock & Data pairs 0-2)	Header SMT, 10x2, 2.54mm
J21	LVDS_DISP2 (Data pair 3)	Header TH, 2x1, 2.54mm
J22	LVDS_DISP2 (Clock & Data pairs 0-2)	Header SMT, 10x2, 2.54mm
J23	I2C#A, I2C#B, SPI#A	Header SMT, 5x2, 2.54mm
J24	Mini PCIe	Mini PCIe Conn, 2x26 0.8mm
J25	HDMI (SOLO/DUAL)	Edge Connector mates to: HSEC8-113-01-L-RA
J26	UART, CANBUS	Header SMT, 10x2, 2.54mm
J27	DMIC	Header TH, 2x1, 2.54mm
J28	FAN 12/5V	Header TH, 2x1, 2.54mm
JBT1	RTC Battery Holder	CR1225 Battery Holder
J1	SOM connection	SO-DIMM 200 Pin Connector

2 Detailed Description

2.1 Overview

This chapter details the Concerto-Board features and external interfaces, some of which are driven directly by the VAR-SOM-6UL/SOLO/DUAL.

Please refer to the SOM data sheet for more information.

Table 2-1 describes this chapter table header and acronyms used.

Table 2-1: Acronyms used on tables column header

Column		Meaning
Pin#	x	Pin number on a connector
Type		Pin type & direction
	I	INPUT
	O	OUTPUT
	DS	Differential Signal
	A	Analog
	P	Power
Signal		Concerto-Board schematic signal name
Description		Pin functionality description

2.2 Concerto-Board Interfaces

2.2.1 SOM

The Concerto-Board features SO-DIMM200 pin mating connector to connect with the VAR-SOM-6UL/SOLODUAL System-on-module.
Please refer to the used SOM module data sheet for a complete signal description and pin-out of J1.

2.3 Standard External Interfaces

2.3.1 USB

The Concerto-Board exposes the two USB 2.0 ports of the VAR-SOM-6UL/SOLO/DUAL.

The ports are named USB#A_HOST and USB#B_OTG.

See Concerto-Board compatibility properties list for mapping of interfaces to each SOM.

2.3.1.1 Micro USB OTG Connector Pin-out (J5)

Note that USB_OTG_ID is not a common function and comes on different pins for the VAR-SOM-6UL and VAR-SOM-SOLO/DUAL

Table 2-2: USB OTG Connector Pin-out (J5)

Pin #	CustomBoard Signal	Type	Description
1	USB#B_OTG_VBUS	PIO	5V power
2	USB_OTG_N	DSIO	USB Data Negative
3	USB_OTG_P	DSIO	USB Data Positive
4	USB_OTG_ID	I	USB Micro ID signal
5	GND	P	Digital Ground
6	GND	P	SHIELD pin reference
7	GND	P	SHIELD pin reference
10	GND	P	SHIELD pin reference
11	GND	P	SHIELD pin reference

2.3.1.2 USB 2.0 HOST Connector Pin-out (J4)

USB#A_HOST routing is by default to the USB Type-A host connector. Customers requiring USB2.0 on the mini-PCIe connector can do so by altering an optional assembly resistors; See schematics USB page.

Table 2-3: USB2.0 Host Connector Pin-out (J4)

Pin #	CustomBoard Signal	Type	Description
1	USB#A_HOST_VBUS	P	+5V power supply. 500ma max
2	USB_HOST_D_N	DSIO	USB Data Negative
3	USB_HOST_D_P	DSIO	USB Data Positive
4	GND	P	Digital ground
5	GND	P	SHIELD pin reference
6	GND	P	SHIELD pin reference

2.3.2 SATA 2.0 Connector Pin-out (J7)

A SATA connector included on the Concerto-Board is included for VAR-SOM-MX6 usage.

Table 2-4: SATA 2.0 Connector Pin-out (J7)

Pin #	CustomBoard Signal	Type	Description
1	GND	P	Digital ground
2	SATAC_TXP	DSIO	SATA Transmit Lane Diff. Positive
3	SATAC_TXN	DSIO	SATA Transmit Lane Diff. Negative
4	GND	P	Digital ground
5	SATAC_RXN	DSIO	SATA Receive Lane Diff. Negative
6	SATAC_RXP	DSIO	SATA Receive Lane Diff. Positive
7	GND	P	Digital ground
8	GND	P	Digital ground
9	GND	P	Digital ground

2.3.3 uSD Card

uSD Card interface is driven by the USDHC interface of the of the SOM.

2.3.3.1 uSD card slot Connector Pin-out (J6)

Table 2-5: uSD Card Slot Connector Pin-out (J6)

Pin #	CustomBoard Signal	Type	Description
1	USDHC#A_DAT2	IO	SD Parallel Data2
2	USDHC#A_DAT3	IO	SD Parallel Data3
3	USDHC#A_CMD	IO	SD Command
4	BASE_PER_3V3	P	SD card 3.3V supply
5	USDHC#A_CLK	I	SD Clock
6	GND	P	Digital Ground
7	USDHC#A_DAT0	IO	SD Parallel Data0
8	USDHC#A_DAT1	IO	SD Parallel Data1
9	USDHC#A_CD_B	O	SD Card Detect
10	GND	P	SHIELD pin reference
11	GND	P	SHIELD pin reference
12	GND	P	SHIELD pin reference
13	GND	P	SHIELD pin reference

2.3.4   Mini PCIe

VAR-SOM-SOLO/DUAL PCI Express interface is exposed by the Concerto-Board through a standard Mini PCI Express connector supporting connection of mini PCI Express expansion card.

2.3.4.1   Mini PCIe Connector Pin-out (J24)

Table 2-6: mini PCI Express Connector Pin-out (J24)

Pin #	CustomBoard Signal	Type	Description
1			
2	BASE_PER_3V3	P	Base board 3.3V
3			
4	GND	P	Digital Ground
5			
6	BASE_PER_1V5	P	Base board 1.5V Limited to 300mA
7			
8			
9	GND	P	Digital Ground
10			
11	PCIE_REF_CLK_N	DSI	PCIe Clock Diff. Negative; 100MHz HCSL
12			
13	PCIE_REF_CLK_P	DSI	PCIe Clock Diff. Positive; 100MHz HCSL
14			
15	GND	P	Digital Ground
16			
17			
18	GND	P	Digital Ground
19			
20	PCIE_DIS_B	I	PCIe Disable (via T.P.)
21	GND	P	Digital Ground
22	PCIE_RESET_B	O	PCIe Reset signal
23	PCIE_CRXM	DSI	PCIe Receive Lane Diff. Negative
24	BASE_PER_3V3	P	Base board 3.3V
25	PCIE_CRXP	DSI	PCIe Receive Lane Diff. Positive
26	GND	P	Digital Ground
27	GND	P	Digital Ground
28	BASE_PER_1V5	P	Base board 1.5V Limited to 300mA
29	GND	P	Digital Ground
30	I2C#C_SCL_BASE	I	I2C#C Clock after signal isolator Requires ETH_RST_B/I2C_BASE_EN_B to be LOW
31	PCIE_CTXM	DSO	PCIe Transmit Lane Diff. Negative
32	I2C#C_SDA_BASE	IO	I2C#A Data after signal isolator

Pin #	CustomBoard Signal	Type	Description
			Requires ETH_RST_B/I2C_BASE_EN_B to be LOW
33	PCIE_CTXP	DSO	PCIe Transmit Lane Diff. Positive
34	GND	P	Digital Ground
35	GND	P	Digital Ground
36	mPCIe_USB#A_D_N	DIO	USB2.0 Diff. Negative; Source is USB#A_HOST via optional resistor assembly.
37	GND	P	Digital Ground
38	mPCIe_USB#A_D_P	DIO	USB2.0 Diff. Negative; Source is USB#A_HOST via optional resistor assembly.
39	BASE_PER_3V3	P	Base board 3.3V
40	GND	P	Digital Ground
41	BASE_PER_3V3	P	Base board 3.3V
42			
43	GND	P	Digital Ground
44			
45			
46			
47			
48	BASE_PER_1V5	P	Base board 1.5V Limited to 300mA
49			
50	GND	P	Digital Ground
51			
52	BASE_PER_3V3	P	Base board 3.3V

2.3.5   Ethernet

The Concerto-Board exports the SOM's Ethernet interface, provided by its' on SOM PHY (Internal), to a standard RJ45 Ethernet jack connector with integrated magnetics.
Please refer to the SOM datasheet for more information.

The Concerto-Board has an additional on-board 10/100 Ethernet PHY (External) routed to a second RJ45 Ethernet jack connector with integrated magnetics for exposing the 2nd 10/100 Ethernet interface available on the VAR-SOM-6UL SOM

2.3.5.1   Internal PHY 10/100/1000BaseT RJ45 Connector Pin-out (J3)

Table 2-7: Internal PHY 10/100/100BaseT RJ45 Connector Pin-out (J3)

Pin #	CustomBoard Signal	Type	Description
L1	BASE_PER_3V3 (via Resistor)	I	Activity LED Anode
L2	ETH#A_LED_ACT	O	Activity LED Cathode
L4	ETH#A_LED_SPD	O	Speed LED Cathode
L5	BASE_PER_3V3 (via Resistor)	I	Speed LED Anode
R1	TCT3	O	Primary transformer common pin for MDI_C
R2	ETH#A_MDI_C_M	DSIO	Bi-directional diff. pair C negative
R3	ETH#A_MDI_C_P	DSIO	Bi-directional diff. pair C positive
R4	ETH#A_MDI_B_P	DSIO	Bi-directional diff. pair B positive
R5	ETH#A_MDI_B_M	DSIO	Bi-directional diff. pair B negative
R6	TCT2	O	Primary transformer common pin for MDI_B
R7	TCT4	O	Primary transformer common pin for MDI_D
R8	ETH#A_MDI_D_P	DSIO	Bi-directional diff. pair D positive
R9	ETH#A_MDI_D_M	DSIO	Bi-directional diff. pair D negative
R10	ETH#A_MDI_A_M	DSIO	Bi-directional diff. pair A negative
R11	ETH#A_MDI_A_P	DSIO	Bi-directional diff. pair A positive
R12	TCT1		Primary transformer common pin for MDI_A
SH1	GND_EARTH	P	EARTH
SH2	GND_EARTH	P	EARTH

2.3.5.2   External PHY 10/100BaseT RJ45 Connector Pin-out (J2)

Table 2-8: External PHY 10/100/100BaseT RJ45 Connector Pin-out (J2)

Pin #	CustomBoard Signal	Type	Description
L1	BASE_PER_3V3 (via Resistor)	I	Activity LED Anode
L2	6UL_LINKLED2	O	Activity LED Cathode
L4	6UL_LINKSPEED2	IO	Link 10/100 LED Anode Link 1000 LED Cathode
L5	BASE_PER_3V3 (via Resistor)	IO	Link 1000 LED Anode Link 10/100 LED Cathode
R1	ETH2_TCT3	O	Primary transformer common pin
R2			Unused pair terminated via 50 Ohm
R3			Unused pair terminated via 50 Ohm
R4	6UL_ETH2_RXDP	DSI	ETH Receive diff. pair Positive
R5	6UL_ETH2_RXDN	DSI	ETH Receive diff. pair Negative
R6	ETH2_TCT2	O	Primary transformer common pin
R7	ETH2_TCT4	O	Primary transformer common pin
R8			Unused pair terminated via 50 Ohm
R9			Unused pair terminated via 50 Ohm
R10	6UL_ETH2_TXDN	DSO	ETH Transmit diff. pair Positive
R11	6UL_ETH2_TXDP	DSO	ETH Transmit diff. pair Negative
R12	ETH2_TCT1		Primary transformer common pin
SH1	GND_EARTH	P	EARTH
SH2	GND_EARTH	P	EARTH

2.3.6   Audio

The Concerto-Board features two 3.5mm jacks for analog audio interfaces.

- Headphone
- Line in

The analog audio interface signals are driven by the SOM Audio Codec. Please refer to the SOM data sheet for complete audio codec information.

Digital microphone is implemented on the Concerto-Board, see schematics for U13.
Digital microphone lines are also routed to optional Header via resistors, making it possible to interface other SOM function on these pins

2.3.6.1   Line In Jack Connector Pin-out (J12)

Table 2-9: Line in Jack Connector Pin-out (J12)

Pin #	CustomBoard Signal	Type	Description
1	AGND	AP	Analog ground return for audio.
2	AC#LINE_IN_R	AI	Line in Right input
3	AC#LINE_IN_L	AI	Line in Left input

2.3.6.2   Headphone jack Connector Pin-out (J11)

Table 2-10: Headphone out Jack Connector Pin-out (J11)

Pin #	CustomBoard Signal	Type	Description
1	AC#HP_FB	AP	Analog ground return for audio.
2	AC#HP_OUT_L	AO	Headphone out Left
3	AC#HP_OUT_R	AO	Headphone out Right

2.3.6.3   Digital Microphone Connector Pin-out (J27)

Table 2-11: Digital Microphone Connector Pin-out (J27)

Pin #	CustomBoard Signal	Type	Description
1	DMIC_CLK	I	Digital Microphone Clock
2	DMIC_DATA	IO	Digital Microphone Data

2.3.7 Serial Camera

The Concerto-Board supports a MIPI CSI camera sensor input using an extension camera board connected to an edge connector. The interface is available on the VAR-SOM-SOLO/DUAL only.

The Camera Board Mating connector: SAMTEC 60POS 0.8mm pitch, HSEC8-130-01-SM-DV-A

2.3.7.1 Serial Camera Connector Pin-out (J19)

Table 2-12: Serial Camera Connector Pin-out (J19)

Pin #	CustomBoard Signal	Type	Description
1	BASE_PER_3V3	P	Base board 3.3V
2	GND	P	Digital Ground
3	BASE_PER_3V3	P	Base board 3.3V
4	I2C#B_SDA_BASE_1V8	IO	I2C Data Requires ETH_RST_B/I2C_BASE_EN_B to be LOW.
5	BASE_PER_1V8	P	Base board 1.8V
6	I2C#B_SCL_BASE_1V8	I	I2C Clock Requires ETH_RST_B/I2C_BASE_EN_B to be LOW.
7	BASE_PER_1V8	P	Base board 1.8V
8	GND	P	Digital Ground
9	GND	P	Digital Ground
10	MIPI-CSI_PWR_EN_1V8	O	Camera Power down signal
11			
12	MIPI-CSI_RST_B_1V8	O	Camera Reset signal
13			
14	MIPI-CSI_OPT_1V8	I	Camera Optional control signal
15	GND	P	Digital Ground
16	MIPI-CSI_SYNC_1V8	I	Camera Sync signal
17			
18	GND	P	Digital Ground
19			
20	MIPI-CSI_TRIG_1V8	I	Camera Trigger signal
21	GND	P	Digital Ground
22	GND	P	Digital Ground
23			
24	MIPI-CSI_D3_N	DSI	CSI Port2 Lane3; Negative
25			
26	MIPI-CSI_D3_P	DSI	CSI Port2 Lane3; Positive

Pin #	CustomBoard Signal	Type	Description
27	GND	P	Digital Ground
28	GND	P	Digital Ground
29			
30	MIPI-CSI_D2_N	DSI	CSI Port2 Lane2; Negative
31			
32	MIPI-CSI_D2_P	DSI	CSI Port2 Lane2; Positive
33	GND	P	Digital Ground
34	GND	P	Digital Ground
35			
36	MIPI-CSI_D1_N	DSI	CSI Port2 Lane1; Negative
37			
38	MIPI-CSI_D1_P	DSI	CSI Port2 Lane1; Positive
39	GND	P	Digital Ground
40	GND	P	Digital Ground
41			
42	MIPI-CSI_CK_N	DSI	CSI Port2 Clock; Negative
43	GND	P	Digital Ground
44	MIPI-CSI_CK_P	DSI	CSI Port2 Clock; Positive
45			
46	GND	P	Digital Ground
47			
48	MIPI-CSI_D0_N	DSI	CSI Port2 Lane0; Negative
49			
50	MIPI-CSI_D0_P	DSI	CSI Port2 Lane0; Positive
51			
52	GND	P	Digital Ground
53	GND	P	Digital Ground
54	BASE_PER_1V8	P	Base board 1.8V
55			
56	BASE_PER_1V8	P	Base board 1.8V
57			
58	BASE_PER_3V3	P	Base board 3.3V
59	GND	P	Digital Ground
60	BASE_PER_3V3	P	Base board 3.3V

Note
Camera control (reset, power down, sync, trigger, optional) and
I2C interfaces run at 1.8V levels.

2.3.8 LVDS

The Concerto-Board exposes two LVDS interfaces. LVDS#A is the shared function on VAR-SOM-6U/SOLO/DUAL.

The interface is exposed to two Variscite standard 20 pin Headers; Fourth data bit of each interface is extended using additional 2 pin connector.

LVDS#A is used for connecting Variscite's standard 7" LVDS LCD screen.

2.3.8.1 LVDS#A Connector Pin-out (J20)

Table 2-13: LVDS#A Connector Pin-out (J20)

Pin #	CustomBoard Signal	Type	Description
1	BASE_PER_3V3	P	Display power 3.3V
2	BASE_PER_3V3	P	Display power 3.3V
3	GND	P	Digital Ground
4	GND	P	Digital Ground
5	LVDS#A_TX0_N	DSO	LVDS#A Data0 Diff. Negative
6	LVDS#A_TX0_P	DSO	LVDS#A Data0 Diff. Positive
7	GND	P	Digital Ground
8	LVDS#A_TX1_N	DSO	LVDS#A Data1 Diff. Negative
9	LVDS#A_TX1_P	DSO	LVDS#A Data1 Diff. Positive
10	GND	P	Digital Ground
11	LVDS#A_TX2_N	DSO	LVDS#A Data2 Diff. Negative
12	LVDS#A_TX2_P	DSO	LVDS#A Data2 Diff. Positive
13	GND	P	Digital Ground
14	LVDS#A_CLK_N	DSO	LVDS#A Clock Diff. Negative
15	LVDS#A_CLK_P	DSO	LVDS#A Clock Diff. Positive
16	GND	P	Digital Ground
17	VCC_5V	P	Display Backlight LED 5V power
18	VCC_5V	P	Display Backlight LED 5V power
19	PWM#A	IO	Backlight Brightness Control
20	GND	P	Digital Ground

2.3.8.2   LVDS#A Data3 Extension Connector Pin-out (J19)

Table 2-14: LVDS#A Data3 Connector Pin-out (J19)

Pin #	CustomBoard Signal	Type	Description
1	LVDS_TX3_N	DSO	LVDS#A Data3 Diff. Negative
2	LVDS_TX3_P	DSO	LVDS#A Data3 Diff. Positive

Note
VAR-SOM-6UL exports LVDS_DAT[0..2] only.
Other functions available on J19.

2.3.8.3   LVDS_DISP2 Connector Pin-out (J22)

The Concerto-Board exports a second LVDS port available on the VAR-SOM-SOLO/DUAL SOMs.

Table 2-15: LVDS_DSIP2 Connector Pin-out (J22)

Pin #	CustomBoard Signal	Type	Description
1	BASE_PER_3V3	P	Base power 3.3V
2	BASE_PER_3V3	P	Base power 3.3V
3	GND	P	Digital Ground
4	GND	P	Digital Ground
5	LVDS_DISP2_D0_N	DSO	LVDS_DISP2 Data0 Diff. Negative
6	LVDS_DISP2_D0_P	DSO	LVDS_DISP2 Data0 Diff. Positive
7	GND	P	Digital Ground
8	LVDS_DISP2_D1_N	DSO	LVDS_DISP2 Data1 Diff. Negative
9	LVDS_DISP2_D1_P	DSO	LVDS_DISP2 Data1 Diff. Positive
10	GND	P	Digital Ground
11	LVDS_DISP2_D2_N	DSO	LVDS_DISP2 Data2 Diff. Negative
12	LVDS_DISP2_D2_P	DSO	LVDS_DISP2 Data2 Diff. Positive
13	GND	P	Digital Ground
14	LVDS_DISP2_CK_N	DSO	LVDS_DISP2 Clock Diff. Negative
15	LVDS_DISP2_CK_P	DSO	LVDS_DISP2 Clock Diff. Positive
16	GND	P	Digital Ground
17	VCC_5V	P	Display Backlight LED 5V power
18	VCC_5V	P	Display Backlight LED 5V power
19	PWM#B	IO	Backlight Brightness Control
20	GND	P	Digital Ground

2.3.8.4 LVDS_DSIP2 Data3 Extension Connector Pin-out (J21)

Table 2-16: LVDS_DISP2 Data3 Connector Pin-out (J21)

Pin #	CustomBoard Signal	Type	Description
1	LVDS_DISP2_D3_P	DSO	LVDS_DISP2 Data3 Diff. Positive
2	LVDS_DISP2_D3_N	DSO	LVDS_DISP2 Data3 Diff. Negative

2.3.9 DSI Display

The Concerto-Board exports a Dual channel DSI available on the VAR-SOM-SOLO/DUAL SOMs. On other pins VAR-SOM-6UL SPI2 interface can be used.

2.3.9.1 DSI Display Connector Pin-out (J3)

Table 2-17: DSI Display Connector Pin-out (J3)

Pin #	CustomBoard Signal	Type	Description
1	BASE_PER_3V3	P	Base power 3.3V
2	BASE_PER_3V3	P	Base power 3.3V
3	GND	P	Digital Ground
4	GND	P	Digital Ground
5	MIPI-DSI_D0_N	DSO	DSI Data0 Diff. Negative
6	MIPI-DSI_D0_P	DSO	DSI Data0 Diff. Positive
7	GND	P	Digital Ground
8	MIPI-DSI_D1_N	DSO	DSI Data1 Diff. Negative
9	MIPI-DSI_D1_P	DSO	DSI Data1 Diff. Positive
10	GND	P	Digital Ground
11	J1.79	DIO	Any alternate function valid for SOM pin 79
12	J1.70	DIO	Any alternate function valid for SOM pin 70
13	GND	P	Digital Ground
14	MIPI-DSI_CK_N	DSO	DSI Clock Diff. Negative
15	MIPI-DSI_CK_P	DSO	DSI Clock Diff. Positive
16	GND	P	Digital Ground
17	J1.77	DIO	Any alternate function valid for SOM pin 77
18	J1.75	DIO	Any alternate function valid for SOM pin 75
19	PWM#C	IO	Backlight Brightness Control
20	GND	P	Digital Ground

2.3.10 HDMI

The Concerto-Board exposes the VAR-SOM-SOLO/DUAL HDMI interface via an extension board using an edge connector.

The HDMI extension board Mating connector: SAMTEC 60POS 0.8mm pitch, HSEC8-113-01-L-RA

2.3.10.1 HDMI Connector Pin-out (J25)

Table 2-18: HDMI Connector Pin-out (J25)

Pin #	CustomBoard Signal	Type	Description
1	J1.79	IO	Any alternate function valid for SOM pin 79
2	BASE_PER_3V3	P	Base Board 3.3V
3	GPLED	DIO	General Purpose Input/Output
4	BASE_PER_3V3	P	Base board 3.3V
5	UART#DBG_RTS	DIO	General Purpose Input/Output; VAR-SOM-6UL: SD1_CD_B require pull down for BOOT-ROM to boot from SD card.
6	VCC_5V	P	Base board 5V
7	UART#A_RTS	DIO	Any alternate function valid for SOM pin 173
8	I2C#B_SCL_BASE	DO	I2C#B SCLK after signal isolator. Requires ETH_RST_B/I2C_BASE_EN_B to be LOW.
9	HDMI_TX_HPD	AI	HDMI Hot Plug Detect
10	I2C#B_SDA_BASE	DIO	I2C#B DATA after signal isolator. Requires ETH_RST_B/I2C_BASE_EN_B to be LOW.
11	HDMI_TX_DDC_CEC	IO	HDMI Consumer Electronics Control; 1 Wire Serial; Bidirectional
12	UART#A_CTS	I	Any alternate function valid for SOM pin 117
13	GND	P	Digital Ground
14	GND	P	Digital Ground
15	HDMI_TX_CK_P	DSO	HDMI TMDS Diff. Clock; Positive
16	HDMI_TX_D0_P	DSO	HDMI TMDS Diff. Data 0; Positive
17	HDMI_TX_CK_N	DSO	HDMI TMDS Diff. Clock; Negative
18	HDMI_TX_D0_N	DSO	HDMI TMDS Diff. Data 0; Negative
19	GND	P	Digital Ground
20	GND	P	Digital Ground
21	HDMI_TX_D2_P	DSO	HDMI TMDS Diff. Data 2; Positive
22	HDMI_TX_D1_P	DSO	HDMI TMDS Diff. Data 1; Positive
23	HDMI_TX_D2_N	DSO	HDMI TMDS Diff. Data 2; Negative
24	HDMI_TX_D1_N	DSO	HDMI TMDS Diff. Data 1; Negative
25	GND	P	Digital Ground
26	GND	P	Digital Ground

2.3.11 Capacitive Touch

The Concerto-Board provides a capacitive Touch interface exposed to an FFC/FPC connector for connecting to Variscite's standard 7" Capacitive touch LCD screen.

2.3.11.1 Capacitive Touch Panel Connector Pin-out (J15)

Table 2-19: Capacitive Touch Panel Connector Pin-out (J15)

Pin #	CustomBoard Signal	Type	Description
1			Capacitive Touch Reset; Active Low; Connected to BASE_PER_3V3 via pull up resistor.
2	I2C#A_SDA	DIO	I2C#A Clock
3	I2C#A_SCL	DO	I2C#A Data
4	CAP_TOUCH_INT_B	DI	Capacitive Touch Interrupt; Active low.
5	BASE_PER_3V3	P	Base board 3.3V
6	GND	P	Digital Ground
7	GND	P	Digital Ground
8	GND	P	Digital Ground

2.3.12 Resistive Touch

The Concerto-Board provides a resistive touch interface common to all SOM's, exposed to an FFC/FPC connector for connecting to resistive touch LCD screen.

2.3.12.1 Resistive Touch Connector Pin-out (J16)

Table 2-20: Resistive Touch Connector Pin-out (J16)

Pin #	CustomBoard Signal	Type	Description
1	TP#_X_NEG	AI	X negative side plate connection
2	TP#_Y_POS	AI	Y positive side plate connection
3	TP#_X_POS	AI	X positive side plate connection
4	TP#_Y_NEG	AI	Y negative side plate connection
5	GND	P	Digital Ground
6	GND	P	Digital Ground

2.3.13 USB - Debug

The Concerto-Board exposes the SOM debug UART#DBG common interface to all SOM's through an on-board UART-to-USB Bridge exposed to a Micro USB connector.

2.3.13.1 USB Debug Connector Pin-out (J9)

Table 2-21: USB Debug Connector Pin-out (J9)

Pin #	CustomBoard Signal	Type	Description
1	DEBUG_VBUS_CON	P	5V power input
2	USB_DEBUG_DM	DSIO	USB Data Negative
3	USB_DEBUG_DP	DSIO	USB Data Positive
4	GND	I	USB Micro ID signal (Slave function)
5	GND	P	Digital Ground
6	GND	P	SHIELD pin reference
7	GND	P	SHIELD pin reference
10	GND	P	SHIELD pin reference
11	GND	P	SHIELD pin reference

2.3.14 UART, CANBUS Connector

The Concerto-Board exports UART and CANBUS interfaces common to all SOMs through 20-Pin Header.

2.3.14.1 UART, CANBUS Connector Pin-out (J26)

Table 2-22: UART, CANBUS Connector Pin-out (J26)

Pin #	CustomBoard Signal	Type	Description
1	UART#BT_TXD	DO	UART#BT Transmit Data;
2	UART#C_TX	DO	UART#C Transmit Data
3	UART#BT_RXD	DI	UART#BT Receive Data
4	UART#C_RX	DI	UART#C Receive Data
5	UART#BT_CTS	DI	UART#BT Clear To Send
6	UART#C_CTS	DI	UART#C Clear To Send
7	UART#BT_RTS	DO	UART#BT Ready To Send
8	UART#C_RTS	DO	UART#C Ready To Send
9	UART#B_TX	DO	UART#B Transmit Data
10	UART#A_TX	DI	UART#A Transmit Data
11	UART#B_RX	DI	UART#B Receive Data
12	UART#A_RX	DI	UART#A Receive Data
13	UART#B_CTS	DI	UART#B Clear To Send
14	UART#A_CTS	DI	UART#A Clear To Send
15	UART#B_RTS	DO	UART#B Ready To Send
16	UART#A_RTS	DO	UART#A Ready To Send
17	CAN#A_H	DSIO	CAN Low Differential signal
18	BASE_PER_3V3	P	Base Board 3.3V
19	CAN#A_L	DSIO	CAN High Differential signal
20	GND	P	Digital Ground

Note
UART#BT used on SOM for Bluetooth function.
UART#A, UART#B_CTS, UART#B_RTS used on SOM-6UL as LCDIF signals.

2.3.15 SAI, I2C, CLKOUT Connector Pin-out (J14)

The Concerto-Board exports SAI#A, I2C#A and CLK_OUT#A interfaces common to all SOMs through a 10-Pin Header.

2.3.15.1 SAI, I2C, CLKOUT, RTC Wake Connector Pin-out (J14)

Table 2-23: SAI, I2C, CLKOUT, RTC Wake Connector Pin-out (J14)

Pin #	CustomBoard Signal	Type	Description
1	SAI#A_RXD	I	SAI#A Receive Data
2	SAI#A_TXD	O	SAI#A Transmit Data
3	SAI#A_RXFS	IO	SAI#A Receive Frame Sync
4	SAI#A_TXFS	O	SAI#A Transmit Frame Sync
5	SAI#A_RXC	IO	SAI#A Receive clock
6	SAI#A_TXC	O	SAI#A Transmit clock
7	I2C#A_SDA	IO	I2C#A Data signal
8	CLK_OUT#A	O	CLK_OUT#A signal
9	I2C#A_SCL	O	I2C#A Clock signal
10	CB_RTC_IRQ_B	O	Output from Concerto Board RTC IRQ; Used to demonstrate RTC wake function. To be connected to a valid GPIO pin.

2.3.16 Resistive Touch I/F, GPIO, Watch Dog Connector Pin-out (J17)

The Concerto-Board exports resistive Touch interface and GPIO interfaces through a 10-Pin Header.

2.3.16.1 Resistive Touch I/F, GPIO, Watch Dog Connector Pin-out (J17)

Table 2-24: Resistive Touch I/F, GPIO, Watch Dog Connector Pin-out (J17)

Pin #	CustomBoard Signal	Type	Description
1	BASE_PER_1V8	P	Base power 1.8V
2	TP#_X_NEG	IO	X negative side plate connection
3	CB_WDOG_B	I	Input to Concerto Board reset and watchdog IC which drives the SOM POR_B signal; Can be used to cause SOM "reboot". To be connected to a valid WDOG alternate function; See J17.8 and J22.19.
4	TP#_Y_POS	IO	Y positive side plate connection
5	CAP_TOUCH_INT_B	I	Any alternate function valid for SOM pin 122; Requires disabling capacitive touch.
6	TP#_X_POS	IO	X positive side plate connection
7	UART#DBG_CTS	IO	Any alternate function valid for SOM pin 86
8	TP#_Y_NEG	IO	Y negative side plate connection
9	MIPI_CSI_BUF_OE_B	IO	Any alternate function valid for SOM pin 73; Care should be taken as this signal controls buffers on the Concerto-Board.
10	J1.82	IO	Any alternate function valid for SOM pin 82; Used on SOM-6UL for LCDIF interface.

2.3.17 I2C, SPI Connector Pin-out (J23)

The Concerto-Board exports I2C#A, I2C#B, SPI#A common interfaces to all SOM's through a 10-Pin Header.

2.3.17.1 I2C, SPI Connector Pin-out (J23)

Table 2-25: I2C, SPI Connector Pin-out (J23)

Pin #	CustomBoard Signal	Type	Description
1	I2C#B_SCL_BASE	DO	I2C#B SCLK
2	GND	P	Digital Ground
3	I2C#B_SDA_BASE	DIO	I2C#B Data
4	ENET2_TX_CLK	DI	SPI#A Serial Data In
5	GPLED	DIO	Any alternate function valid for SOM pin 48
6	ENET2_RX_ER	DO	SPI#A Slave Select
7	I2C#C_SDA_BASE	DIO	I2C#C Data
8	ENET2_TX_EN	DO	SPI#A Serial Data Out
9	I2C#C_SCL_BASE	DO	I2C#C SCLK
10	ENET2_TD1	DO	SPI#A Serial Clock

Note
In order to use the I2C and SPI signals
ETH_RST_B/I2C_BASE_EN_B signal must be pulled LOW;

2.4 User Interfaces

2.4.1 Control Buttons

2.4.1.1 Power Switch (SW1)

The Power Switch SW1 Connect/Isolate the DC Power input to the Concerto-Board.

2.4.1.2 Boot Select (SW2)

The Boot select switch sets the SOM boot source & sequence. Refer to the SOM data sheet for detailed Boot description.

Table 2-26: Boot Select modes (SW3)

Position	Logic Level	Boot Source
OFF	High	Internal
ON	Low	External (SD card)

Note:
Note: Resistor options exist to support other boot sources for VAR-SOM-SOLO.
Please refer to SOM datasheet.
Internal pull up exist on all SOM's.

2.4.1.3 Reset Button (SW3)

A press on SW3 will perform a system reset of the SOM.

2.4.1.4 User Buttons (SW4, SW5)

SW4 and SW5 are User Buttons for general purpose.
In Linux release they can be configured in the device tree file as e.g. Back, wakeup and other function Buttons.

2.4.2 LED Indications

2.4.2.1 Power-On LEDs

Three LED indicators used:

- **D1** indicates that the Concerto-Board Carrier VCC_3V3 power is ON
- **D2** indicates that the Concerto-Board Carrier VCC_5V power is ON
- **D3** indicates that the Concerto-Board BASE_PER_3V3 is ON; Base peripherals 3.3V power enabled by the SOM SOM_3V3_PER output power.

2.4.2.2 GP LED (D23)

LED D23 is a General-Purpose functionality LED controlled by a SOM GPIO signal.

2.4.3 Power

The Concerto-Board is powered by a +12V power supply, connected either through a 2.0 mm power plug or alternatively through a 2 pin Terminal block.

A 5V fan power output is available via shrouded 2 pin header.
Mating Housing Molex 22-01-3027; **Connector Terminal** Female Molex 08-50-0114;

2.4.3.1 DC-in Jack Pin-out (J10)

Table 2-27: DC-in Jack Pin-out (J10)

Pin #	CustomBoard Signal	Type	Description
1	GND	P	Digital Ground
2	GND	P	Digital Ground
3	VCC_12V	P	Power supply 12V
4	VCC_12V	P	Power supply 12V

2.4.3.2 DC-in Terminal Block Pin-out (J100)

Table 2-28: DC-in 2 pins Terminal Block Pin-out (J100)

Pin #	CustomBoard Signal	Type	Description
1	GND	P	Digital Ground
2	VCC_12V	P	Power supply 12V

2.4.3.3 DC-out FAN 5V Pin-out (J28)

Table 2-29: DC-out 5V FAN Header Pin-out (J28)

Pin #	CustomBoard Signal	Type	Description
1	FAN_PWR	P	Power supply 5V out; Customer requiring 12V can do so by moving R97 to R96.
2	GND	P	Ground Return

2.4.3.4   SATA Power DC-Out Pin-out (J8)

A 5V,3.3V power output is available via shrouded 3 pin header for SATA power.
Mating Housing Molex 22-01-3037; **Connector Terminal** Female Molex 08-50-0114;

Table 2-30: SATA Power DC-OUT Connector Pin-out (J9)

Pin #	CustomBoard Signal	Type	Description
1	BASE_PER_3V3	P	Base Board 3.3V
2	GND	P	Ground Return
3	VCC_5V	P	Base board 5V

2.4.3.5   RTC Backup Battery (JBT1)

The Concerto-Board features JBT1, a CR1225 battery holder for powering the
On board ISL12057IUZ RTC Module.

3 Electrical Environmental Specifications

3.1 Absolute maximum electrical specifications

Table 3-1: DC Power Input absolute maximum electrical specifications

	Min	Max
Main Power Supply, DC-IN	-0.3V	20V

3.2 Operational electrical specifications

Table 3-2: DC Power Input Operational electrical specifications

	Min	Max
Main Power Supply, DC-IN	8V	18V

4 Environmental specifications

Table 4-1: Environmental specifications

.	Min	Max
Commercial operating temperature range	0^0C	$+70^0$C
MTBF	>10kHRS	
Relative humidity, Operational	10%	90%
Relative humidity, Storage	5%	95%

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