VARISCITE LTD

VAR-MX7CustomBoard Datasheet

Carrier-board for the VAR-SOM-MX7

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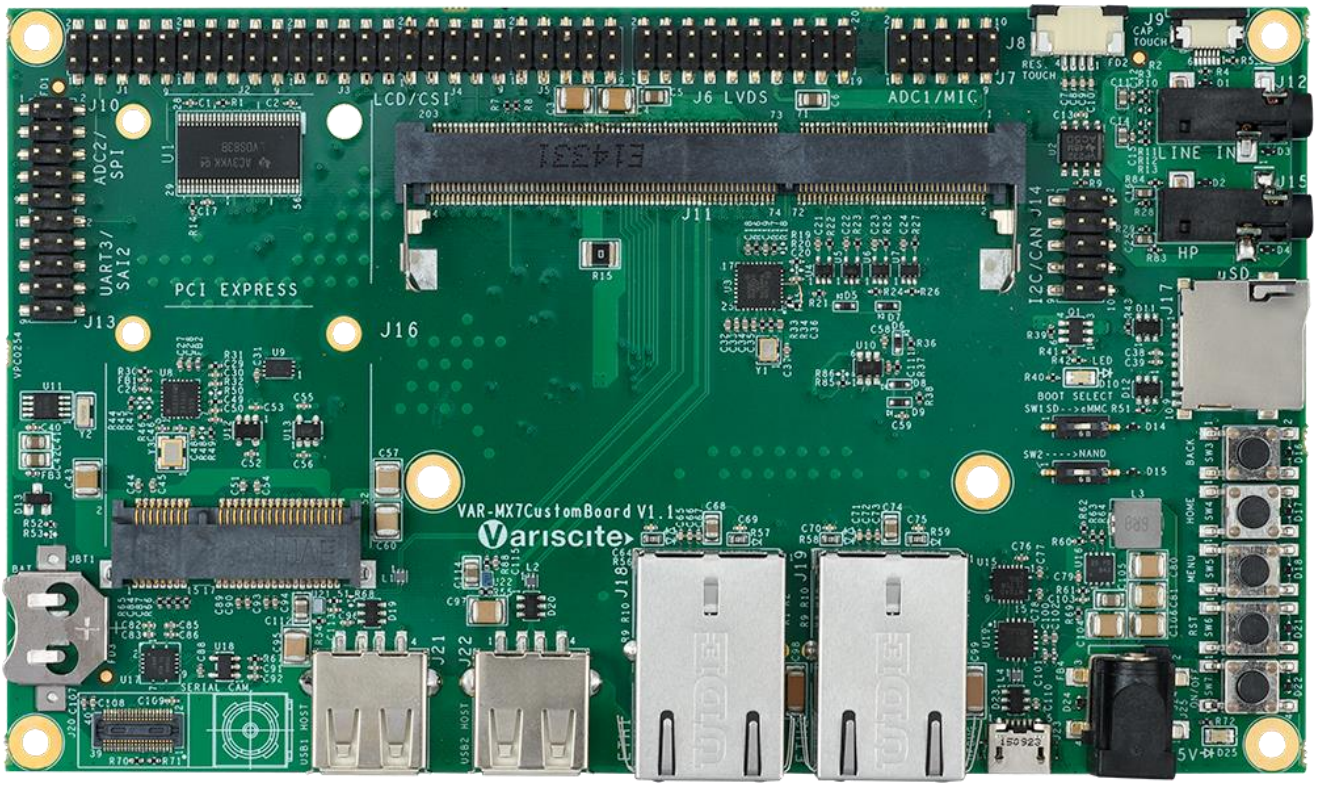

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Variscite Ltd.
4, Hamelacha st.
Lod.
P.O.B 1121
Airport City, 70100
ISRAEL
Phone +972 (9) 9562910 • Fax +972 (9) 9589477

Revision History

Revision	Date	Notes
1.0	13/10/2016	Initial

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1 Overview

This chapter gives an overview of the VAR-MX7CustomBoard.

1.1 General Information

The VAR-MX7CustomBoard is a complete development board, utilizing all of the VAR-SOM-MX7 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.

1.1.1 Supporting Variscite products

- VAR-SOM-MX7
- 7" Capacitive touch LCD

1.1.2 Supporting O.S

- Linux BSP

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.

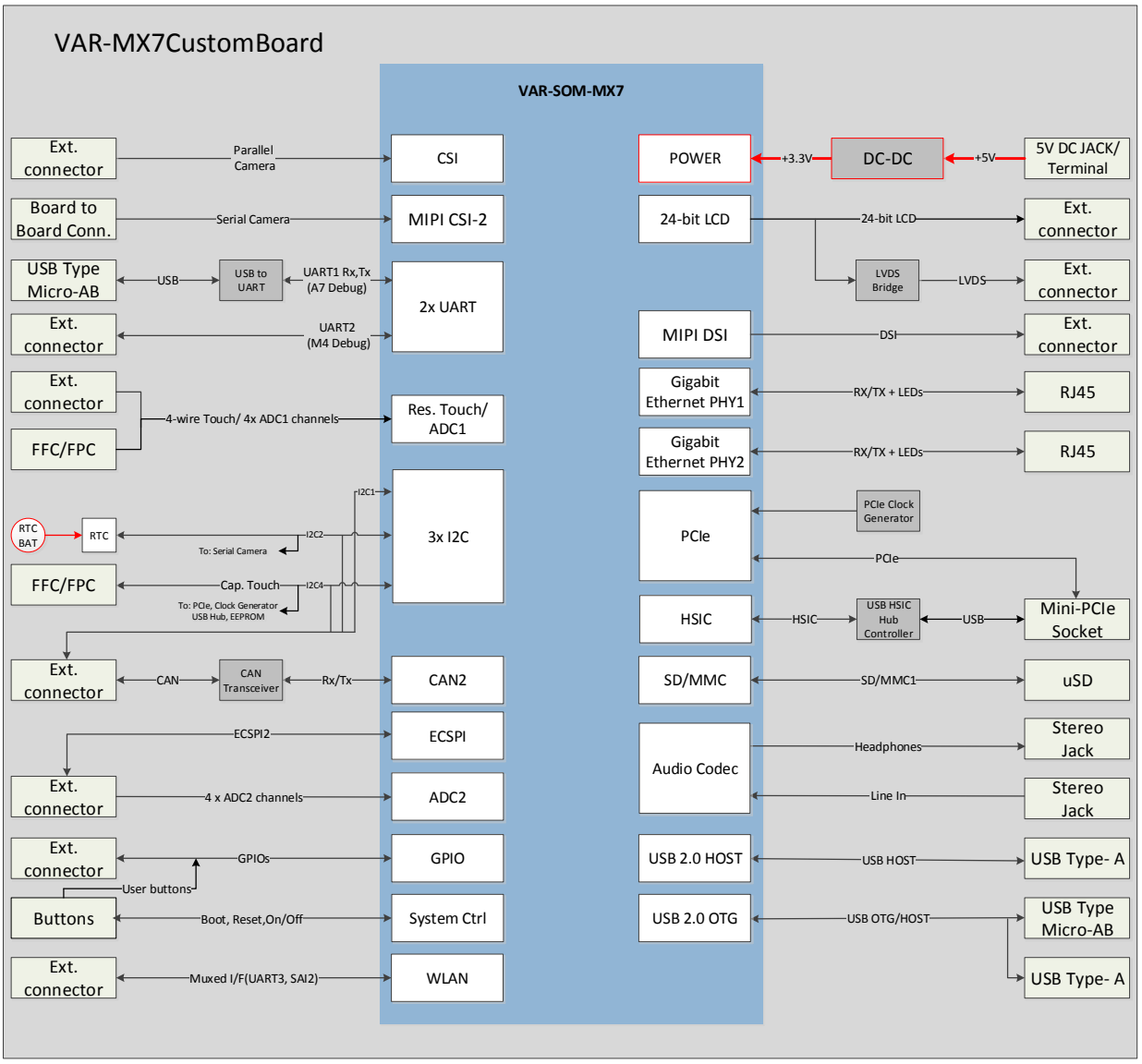
1.2 VAR-MX7CustomBoard features summary

- SO-DIMM204 socket, compatible with the VAR-SOM-MX7
- Display
  - 18 bit LVDS Interface supporting Variscite's 7" TFT capacitive touch LCD
  - 24 bit LCD interface Header
  - DSI Header
- Touch panel interface
  - Capacitive - I2C based
  - Resistive
- Ethernet
  - 2 x 10/100/1000BaseT – RJ45
- Mini PCIe Connector
- USB
  - USB2.0 OTG ,Type Micro AB + Type A (for Host only option)
  - USB2.0 Host Type A
- AUDIO
  - 3.5mm Headphones jack
  - 3.5mm Line in jack
  - Analog Microphone Header
- µSD-Card slot
- Camera
  - Serial interface - OV5640 MIPI CSI sensor
  - Parallel interface Header
- CAN Bus
  - 1Mbit CAN bus Header
- Debug
  - USB debug (UART1) - Type Micro AB
- ISL12057 RTC
- Additional
  - SAI (Serial Audio Interface) Header
  - 2 x 4-channel ADC Headers
  - UART, ECSPI, I2C Headers

- General purpose LED, Buttons (General Purpose + control)

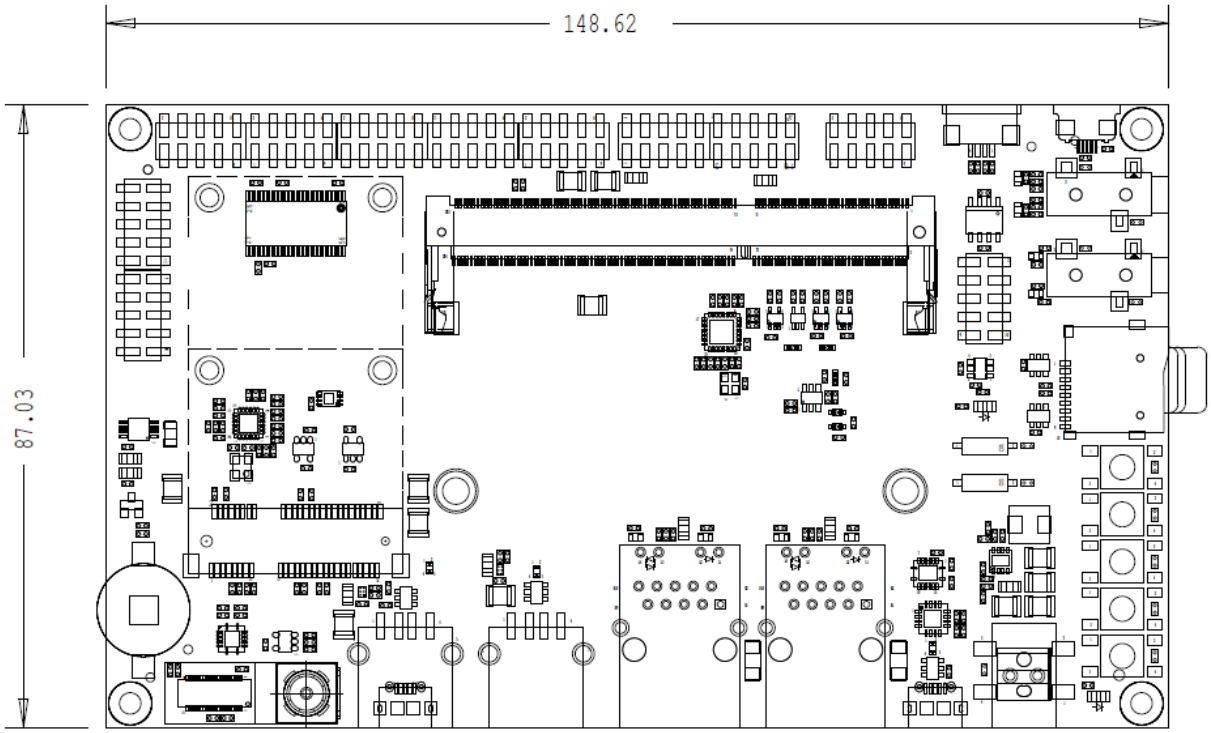
- Power
  - 5V DC Input. - 2.0mm DC jack / 2 pin Terminal Block
  - RTC Backup battery - CR1225 Battery Holder

1.3 Block Diagram



1.4 Board Layout

The VAR-MX7CustomBoard's physical dimensions are 148 x 87 mm.



Detailed CAD files are available for download at www.variscite.com.

1.5 VAR-MX7CustomBoard connectors

The below table lists all available connectors on the VAR-MX7CustomBoard, Refer to chapter 2 for a more detailed description and Pin-out of each connector.

Reference	Function	Type
J1	LCD	Header SMT, 5x2, 2.54mm
J2	LCD	Header SMT, 5x2, 2.54mm
J3	LCD	Header SMT, 5x2, 2.54mm
J4	Parallel Camera	Header SMT, 5x2, 2.54mm
J5	Parallel Camera, UART2	Header SMT, 5x2, 2.54mm
J6	LVDS (Clock & Data pairs 0-2)	Header SMT, 10x2, 2.54mm
J7	ADC1, Analog mic, GPIO	Header SMT, 5x2, 2.54mm
J8	Resistive Touch I/F	FFC/FPC 4-pin
J9	Capacitive Touch Panel I/F	FFC/FPC 6-pin
J10	ECSPI, ADC2	Header SMT, 5x2, 2.54mm
J11	VAR-SOM-MX7	SO-DIMM 204 Pin Connector
J12	Line In	Audio Jack 3.5 mm
J13	UART3/SAI2	Header SMT, 5x2, 2.54mm
J14	I2C/CAN Bus	Header SMT, 5x2, 2.54mm
J15	Headphones	Audio Jack 3.5 mm
J16	Mini PCIe Conn	Mini PCIe Conn, 2x26 0.8mm
J17	SD-MMC	uSD Connector
J18	10/100/1000Mbps ETH1 Port	RJ-45
J19	10/100/1000Mbps ETH2 Port	RJ-45
J20	Serial Camera sensor OV5640 Conn	Board to Board, 40Pos, 0.5mm
J21	USB Host	USB Type A
J22	USB Host	USB Type A
J23	USB Debug	USB Type micro AB
J24	Power In	2 Pin Terminal Block
J25	Power In	DC In Jack 2.0 mm
J26	DSI	Header SMT 5x2, 2.54mm
J27	USB OTG	USB Type micro AB
JBT1	RTC Battery Holder	CR1225 Battery Holder

Table 1-1 VAR-MX7CustomBoard connectors

2 Detailed Description

2.1 Overview

This chapter details the VAR-MX7CustomBoard's features and external interfaces, some of which are driven directly by the VAR-SOM-MX7.
Please refer to the VAR-SOM-MX7 data sheet for more information regarding those interfaces.

The following list describes this chapter table's column header:

Pin#:
Pin Number of the specific connector

VAR-MX7CustomBoard Signal:
VAR-MX7CustomBoard schematic signal name

Type:
Pin Type & Direction:

- I – In
- O – Out
- DS – Differential Signal
- P – Power
- A – Analog

Description:
Short Pin functionality description

2.2 VAR-MX7CustomBoard Interfaces

2.2.1 VAR-SOM-MX7

The VAR-SOM-MX7 features an SO-DIMM 204 Pin standard connector to connect with the VAR-SOM-MX7 System-om-module. Please refer to the VAR-SOM-MX7 module data sheet for a complete signal description and pin-out.

2.3 Standard External Interfaces

2.3.1 USB HOST & OTG

The VAR-SOM-MX7 drives one USB port to a Host Connector and another USB port to both Host and OTG connectors. For using USB port in OTG mode J27 needs to be assembled and USB mode should be changed in device tree.

Please refer to http://variwiki.com/index.php?title=VAR-SOM-MX7 for more information.

2.3.1.1 USB HOST Connector Pin-out (J22)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	USB_HOST_VBUS	P	+5V power supply. 500ma max
2	USB_OTG2_DN_C	DSI/O	USB Data Negative
3	USB_OTG2_DP_C	DSI/O	USB Data Positive
4	DGND	P	Digital ground

Table 2-1 USB Host Connector Pin-out (J22)

2.3.1.2 USB HOST Connector Pin-out (J21)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	USB_OTG_VBUS	P	+5V power supply. 500ma max
2	USB_OTG1_DN_C	DSI/O	USB Data Negative
3	USB_OTG1_DP_C	DSI/O	USB Data Positive
4	DGND	P	Digital ground

Table 2-2 USB Host to Host Connector Pin-out (J21)

2.3.1.3 USB OTG to OTG Connector Pin-out (J27)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	USB_OTG_VBUS	P	5V in/out (Client/host)
2	USB_OTG1_DN_C	DSI/O	USB Data Negative
3	USB_OTG1_DP_C	DSI/O	USB Data Positive
4	USB_OTG1_ID	I	USB OTG ID signal (‘1’ - Device mode)
5	DGND	P	Digital ground

Table 2-3 USB OTG to OTG Connector Pin-out (J27)

2.3.2 uSD Card

uSD Card interface is driven by the SD/MMC1 interface of the of the VAR-SOM-MX7.

2.3.2.1 uSD card slot Connector Pin-out (J17)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	SD1_DATA2	IO	SD Parallel Data2
2	SD1_DATA3	IO	SD Parallel Data3
3	SD1_CMD	IO	SD command
4	BASE_PER_3V3	P	Peripherals Power supply 3.3V
5	SD1_CLK	O	SD Clock
6	DGND	P	Digital ground
7	SD1_DATA0	IO	SDC Parallel Data0
8	SD1_DATA1	IO	SDC Parallel Data1
9	SD1_CD_B	IO	SD Card Detect
10	DGND	P	Digital ground
11	DGND	P	Digital ground
12	DGND	P	Digital ground
13	DGND	P	Digital ground

Table 2-4 uSD Card slot Connector Pin-out (J17)

2.3.3 Mini PCIe

The VAR-SOM-MX7 PCI Express interface is exposed by the VAR-MX7CustomBoard through a standard Mini PCI Express connector supporting connection of mini PCI Express expansion cards.

2.3.3.1 Mini PCIe Connector Pin-out (J16)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1			
2	BASE_PER_3V3	P	Peripherals Power supply 3.3V
3			
4	DGND	P	Digital Ground
5			
6	BASE_PER_1V5	P	1.5V power supply limited to 300mA
7			
8			
9	DGND	P	Digital Ground
10			
11	PCIe_CREFCLKM	DSO	PCIe Clock pair negative
12			
13	PCIe_CREFCLKP	DSO	PCIe Clock pair positive
14			
15	DGND	P	Digital Ground
16			
17			
18	DGND	P	Digital Ground
19			
20			
21	DGND	P	Digital Ground
22	PCIE_RESET_B	O	PCIe Reset signal
23	PCIe_CRXM	DSI	PCIe Receive pair negative
24	BASE_PER_3V3	P	Peripherals Power supply 3.3V
25	PCIe_CRXP	DSI	PCIe Receive pair positive
26	DGND	P	Digital Ground
27	DGND	P	Digital Ground
28	BASE_PER_1V5	P	1.5V power supply limited to 300mA
29	DGND	P	Digital Ground
30	I2C4_SCL	O	I2C4 clock signal
31	PCIe_CTXM	DSO	PCIe Transmit pair negative
32	I2C4_SDA	IO	I2C4 data signal
33	PCIe_CTXP	DSO	PCIe Transmit pair positive
34	DGND	P	Digital Ground
35	DGND	P	Digital Ground

36	PCIE_USB_DM	DSI/O	USB Data Negative
37	DGND	P	Digital Ground
38	PCIE_USB_DP	DSI/O	USB Data Positive
39	BASE_PER_3V3	P	Peripherals Power supply 3.3V
40	DGND	P	Digital Ground
41	BASE_PER_3V3	P	Peripherals Power supply 3.3V
42			
43	DGND	P	Digital Ground
44			
45			
46			
47			
48	BASE_PER_1V5	P	1.5V power supply limited to 300mA
49			
50	DGND	P	Digital Ground
51			
52	BASE_PER_3V3	P	Peripherals Power supply 3.3V

Table 2-5 mini PCI Express Connector Pin-out (J16)

2.3.4 Ethernet

The VAR-MX7CustomBoard exposes 2 Gigabit Ethernet interfaces to standard RJ45 Ethernet jack connectors with integrated magnetics using 2 On-Board Gigabit Ethernet PHY driven by the RGMII interface exposed by the VAR-SOM-MX7.
Please refer to the VAR-SOM-MX7 datasheet for more information.

2.3.4.1 10/100/1000BaseT RJ45 Connector Pin-out (J18)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
R1	ETH1_MDI_A_P	DSI/O	Bi-directional pair A positive
R2	ETH1_MDI_A_M	DSI/O	Bi-directional pair A negative
R3	ETH1_MDI_B_P	DSI/O	Bi-directional pair B positive
R4	ETH1_MDI_B_M	DSI/O	Bi-directional pair B negative
R5	TRCT1	O	O
R6	TRCT2	O	O
R7	ETH1_MDI_C_P	DSI/O	Bi-directional pair C positive
R8	ETH1_MDI_C_M	DSI/O	Bi-directional pair C negative
R9	ETH1_MDI_D_P	DSI/O	Bi-directional pair D positive
R10	ETH1_MDI_D_M	DSI/O	Bi-directional pair D negative
L1	DGND	P	Digital ground
L2	ETH1_LED_ACT	O	Activity LED Anode (see LED Status Table)
L3	ETH1_LED_LINK_10_100	IO	Link 10/100 LED Anode; Link 1000 LED Cathode (see LED Status Table)
L4	ETH1_LED_LINK_1000	IO	Link 1000 LED Anode; Link 10/100 LED Cathode (see LED Status Table)
SH1	EARTH	P	EARTH
SH2	EARTH	P	EARTH

Table 2-6 10/100/100BaseT RJ45 Connector Pin-out (J18)

2.3.4.2 10/100/1000BaseT RJ45 Connector Pin-out (J19)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
R1	ETH2_MDI_A_P	DSI/O	Bi-directional pair A positive
R2	ETH2_MDI_A_M	DSI/O	Bi-directional pair A negative
R3	ETH2_MDI_B_P	DSI/O	Bi-directional pair B positive
R4	ETH2_MDI_B_M	DSI/O	Bi-directional pair B negative
R5	TRCT1	O	O
R6	TRCT2	O	O
R7	ETH2_MDI_C_P	DSI/O	Bi-directional pair C positive
R8	ETH2_MDI_C_M	DSI/O	Bi-directional pair C negative
R9	ETH2_MDI_D_P	DSI/O	Bi-directional pair D positive
R10	ETH2_MDI_D_M	DSI/O	Bi-directional pair D negative
L1	DGND	P	Digital ground
L2	ETH2_LED_ACT	O	Activity LED Anode (see LED Status Table)
L3	ETH2_LED_LINK_10_100	IO	Link 10/100 LED Anode; Link 1000 LED Cathode (see LED Status Table)
L4	ETH2_LED_LINK_1000	IO	Link 1000 LED Anode; Link 10/100 LED Cathode (see LED Status Table)
SH1	EARTH	P	EARTH
SH2	EARTH	P	EARTH

Table 2-7 10/100/100BaseT RJ45 Connector Pin-out (J19)

STATUS / **LED**	**10M Link**	**10M Active**	**100M Link**	**100M Active**	**1000M Link**	**1000M Active**
LED_LINK_10_100	OFF	OFF	ON	ON	OFF	OFF
LED_LINK_1000	OFF	OFF	OFF	OFF	ON	ON
LED_ACT	ON	BLINK	ON	BLINK	ON	BLINK

Table 2-8 RJ-45 Connector Led status (J18,J19)

2.3.5 AUDIO

The VAR-MX7CustomBoard features two 3.5mm jacks for audio interfaces.

- Headphone
- Line in

The Headphones signals are driven by the VAR-SOM-MX7, while the Line in signals are driven to the VAR-SOM-MX7.
Please refer to the VAR-SOM-MX7 data sheet for complete audio codec information.

2.3.5.1 Headphone jack Connector Pin-out (J15)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	AGND	AP	Audio Ground
2	HPLOUT_C	AO	Headphone out left
3	HPROUT_C	AO	Headphone out right

Table 2-9 Headphone Jack Connector Pin-out (J15)

2.3.5.2 Line In jack Connector Pin-out (J12)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	AGND	AP	Audio Ground
2	LLINEIN_C	AI	Line in Left input
3	RLINEIN_C	AI	Line in Right input

Table 2-10 Line In Jack Connector Pin-out (J12)

2.3.6 Serial Camera

The VAR-MX7CustomBoard hosts a MIPI CSI camera sensor OmniVision OV5640
Driven by the VAR-SOM-MX7. Compatible camera is Variscite camera module
PN: VCAM-OV5640 based on the OmniVision OV5640.
The camera connector on the VAR-MX7CustomBoard is a Hirose connector receptacle 40POS 0.4mm, DF30FC-40DS-0.4V. Suggested camera mating connector is Hirose connector Header 40POS 0.4mm, DF30RC-40DP-0.4V.

2.3.6.1 Serial Camera Connector Pin-out (J20)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	DGND	P	Digital Ground
2	DGND	P	Digital Ground
3			
4	BASE_PER_2V8	P	Camera Power supply 2.8V

Pin #	VAR-MX7CustomBoard Signal	Type	Description
5	I2C_A_SDA_18	IO	Sensor I2C Data
6			
7	I2C_A_SCL_18	O	Sensor I2C Clock
8	BASE_PER_2V8	P	Camera Power supply 2.8V
9	BASE_PER_1V8	P	Sensor reset
10			
11			
12			
13			
14			
15			
16	MIPI_CSI_D1_P	DSI	Camera Data 1 Positive
17	DGND	P	Sensor Power Down
18	MIPI_CSI_D1_N	DSI	Camera Data 1 Negative
19			
20	DGND	P	Digital Ground
21			
22	MIPI_CSI_CLK_P	DSI	Camera Clock Positive
23			
24	MIPI_CSI_CLK_N	DSI	Camera Clock Negative
25			
26	DGND	P	Digital Ground
27			
28	MIPI_CSI_D0_P	DSI	Camera Data 0 Positive
29			
30	MIPI_CSI_D0_N	DSI	Camera Data 0 Negative
31			
32	DGND	P	Digital Ground
33			
34	MIPI_CSI_CLK_18	O	Camera Clock
35			
36			
37			
38	BASE_PER_1V8	P	Camera Power supply 1.8V
39			
40	DGND	P	Digital Ground

Table 2-11 Serial Camera Connector Pin-out (J20)

2.3.7 Parallel RGB LCD

The VAR-MX7CustomBoard exposes a 24 bit Parallel LCD interface routed directly to the processor's pins through 3 standard 10 pin Headers.

2.3.7.1 Parallel LCD Connector #1 Pin-Out (J1)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	LCD1_ENABLE	O	LCD Enable Signal
2	LCD1_VSYNC	O	LCD Vertical Sync
3	LCD1_RESET	O	LCD Reset
4	LCD1_HSYNC	O	LCD Horizontal Sync
5	LCD1_CLK	O	LCD Pixel Clock
6	PWM2	O	PWM 2 Output
7	LCD1_DATA0	O	LCD Data 0[1]
8	LCD1_DATA1	O	LCD Data 1[1]
9	LCD1_DATA2	O	LCD Data 2[1]
10	LCD1_DATA3	O	LCD Data 3[1]

Table 2-12 Parallel LCD Connector #1 Pin-Out (J1)

Note:

[1] Pin is being latched at boot to determine boot sequence. External drivers to this pin should be disabled in time of boot otherwise they may change the boot option and the SOM will not boot. Refer to VAR-SOM-MX7 datasheet for more details.

2.3.7.2 Parallel LCD Connector #2 Pin-Out (J2)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	LCD1_DATA4	O	LCD Data 4
2	LCD1_DATA5	O	LCD Data 5
3	LCD1_DATA6	O	LCD Data 6
4	LCD1_DATA7	O	LCD Data 7
5	LCD1_DATA8	O	LCD Data 8
6	LCD1_DATA9	O	LCD Data 9
7	LCD1_DATA10	O	LCD Data 10
8	LCD1_DATA11	O	LCD Data 11
9	LCD1_DATA12	O	LCD Data 12
10	LCD1_DATA13	O	LCD Data 13

Table 2-13 Parallel LCD Connector #2 Pin-Out (J2)

2.3.7.3 Parallel LCD Connector #3 Pin-Out (J3)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	LCD1_DATA14	O	LCD Data 14
2	LCD1_DATA15	O	LCD Data 15
3	LCD1_DATA16	O	LCD Data 16[1]
4	LCD1_DATA17	O	LCD Data 17[1]
5	LCD1_DATA18	O	LCD Data 18[1]
6	LCD1_DATA19	O	LCD Data 19[1]
7	LCD1_DATA20	O	LCD Data 20
8	LCD1_DATA21	O	LCD Data 21
9	LCD1_DATA22	O	LCD Data 22
10	LCD1_DATA23	O	LCD Data 23

Table 2-14 Parallel LCD Connector #3 Pin-Out (J3)

Note:
[1] Pin is being latched at boot to determine boot sequence. External drivers to this pin should be disabled in time of boot otherwise they may change the boot option and the SOM will not boot. Refer to VAR-SOM-MX7 datasheet for more details.

2.3.8 LVDS

The VAR-MX7CustomBoard exposes a 3 data lane LVDS interface driven by the RGB to LVDS converter assembled on the VAR-MX7CustomBoard.
The interface is exposed to a standard 20 pin Header for connecting Variscite's standard 7" LVDS LCD screen.

2.3.8.1 LVDS Connector Pin-out (J6)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	BASE_PER_3V3	P	Peripherals Power supply 3.3V
2	BASE_PER_3V3	P	Peripherals Power supply 3.3V
3	DGND	P	Digital ground
4	DGND	P	Digital ground
5	RXIN0-	DSO	LVDS lane 0, negative signal
6	RXIN0+	DSO	LVDS lane 0, positive signal
7	DGND	P	Digital ground
8	RXIN1-	DSO	LVDS lane 1, negative signal
9	RXIN1+	DSO	LVDS lane 1, positive signal
10	DGND	P	Digital ground
11	RXIN2-	DSO	LVDS lane 2, negative signal
12	RXIN2+	DSO	LVDS lane 2, positive signal
13	DGND	P	Digital ground

Pin #	VAR-MX7CustomBoard Signal	Type	Description
14	CLKIN-	DSO	LVDS clock, negative signal
15	CLKIN+	DSO	LVDS clock, positive signal
16	DGND	P	Digital ground
17	VCC_5V	P	VLED +5V Power supply
18	VCC_5V	P	VLED +5V Power supply
19	PWM2	O	Backlight brightness control
20	DGND	P	Digital ground

Table 2-15 LVDS Connector Pin-out (J6)

2.3.9 Capacitive Touch

The VAR-SOM-MX7 provides a capacitive Touch interface exposed to a FFC/FPC connector for connecting to Variscite's standard 7" Capacitive touch LCD screen.

2.3.9.1 Capacitive Touch Panel Connector Pin-out (J9)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	RESET	O	Reset signal
2	I2C4_SDA	IO	I2C3 data signal
3	I2C4_SCL	O	I2C3 clock signal
4	GPIO2_IO[30]	I	Interrupt signal connected to GPIO1[4]
5	BASE_PER_3V3	P	Peripherals Power supply 3.3V
6	DGND	P	Digital ground
7	DGND	P	Digital ground
8	DGND	P	Digital ground

Table 2-16 Capacitive Touch Panel Connector Pin-out (J9)

2.3.10 Resistive Touch

The VAR-MX7CustomBoard provides a resistive interface exposed to a FFC/FPC connector for connecting to resistive touch LCD screen. The touch interface is exported by the on SOM TI's TSC2046 resistive touch controller.

2.3.10.1 Resistive Touch Connector Pin-out (J8)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	TS_X-	AI	Touch Screen X Minus
2	TS_Y+	AI	Touch Screen Y Plus
3	TS_X+	AI	Touch Screen X Plus
4	TS_Y-	AI	Touch Screen Y Minus
5	DGND	P	Digital Ground

6	DGND	P	Digital Ground

Table 2-17 Resistive Touch Connector Pin-out (J8)

2.3.11 DSI

The VAR-SOM-MX7 exports the DSI interface a high performance serial interconnect bus for mobile applications connecting display system to the host system.
The signals are exported to a standard 10 pin Header (Not assembled by default).

2.3.11.1 DSI Connector Pin- out (J26)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	BASE_PER_3V3	P	Peripherals Power supply 3.3V
2			
3	MIPI_DSI_D1_N	DSO	Negative DSI data 1 differential
4	MIPI_DSI_D0_N	DSO	Negative DSI data 0 differential
5	MIPI_DSI_D1_P	DSO	Positive DSI data 1 differential
6	MIPI_DSI_D0_P	DSO	Positive DSI data 0 differential
7	MIPI_DSI_CLK_N	DSO	Negative DSI clock differential
8			
9	MIPI_DSI_CLK_P	DSO	Positive DSI clock differential
10	DGND	P	Digital Ground

Table 2-18 DSI Connector Pin-out (J26)

2.3.12 USB - Debug

The VAR-SOM-MX7 exposes the debug UART1 interface to the VAR-MX7CustomBoard.The signals are driven by an on-board UART-to-USB Bridge and exposed to a Micro USB connector.

2.3.12.1 USB Debug Connector Pin-out (J23)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	DEBUG_VBUS_C	P	5V power input
2	USB_DEBUG_DM_C	DSI/O	USB Data Negative
3	USB_DEBUG_DP_C	DSI/O	USB Data Positive
4	DGND	P	Digital ground
5	DGND	P	Digital ground

Table 2-19 USB Debug Connector Pin-out (J23)

2.3.13 Parallel Camera and UART2

The VAR-MX7CustomBoard exposes an 8 bit Parallel camera interface routed directly to the processor's pins and 4 line UART2 interface through standard 10 pin Headers. (Suggested UART to USB Debug Cable: TTL-232R-RPi or C232HD-DDHSP-0).

2.3.13.1 Parallel Camera Connector Pin-Out (J4)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	CSI1_MCLK	O	Camera Master clock[1]
2	CSI1_PIXCLK	I	Camera Pixel Clock signal[1]
3	CSI1_HSYNC	I	Camera Horizontal Sync signal[1]
4	CSI1_VSYNC	I	Camera Vertical Sync signal[1]
5	CSI1_DATA[2]	I	Camera Data 2 signal[1]
6	CSI1_DATA[3]	I	Camera Data 3 signal[1]
7	CSI1_DATA[4]	I	Camera Data 4 signal[1]
8	CSI1_DATA[5]	I	Camera Data 5 signal[1]
9	CSI1_DATA[6]	I	Camera Data 6 signal[1]
10	CSI1_DATA[7]	I	Camera Data 7 signal[1]

Table 2-20 Parallel Camera Connector Pin-out (J4)

Note:

[1] Pin is being latched at boot to determine boot sequence. External drivers to this pin should be disabled in time of boot otherwise they may change the boot option and the SOM will not boot. Refer to VAR-SOM-MX7 datasheet for more details.

2.3.13.2 Parallel Camera and UART2 Connector Pin-Out (J5)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	CSI1_DATA[8]	I	Camera Data 8 signal[1]
2	CSI1_DATA[9]	I	Camera Data 9 signal[1]
3	BASE_PER_3V3	P	Peripherals Power supply 3.3V
4	VCC_5V	P	Power supply +5V
5	UART2_RX	I	UART2 Receive
6	UART2_RTS_B	I	UART2 RTS
7	UART2_TX	O	UART2Transmit
8	UART2_CTS_B	O	UART2 CTS
9	DGND	P	Digital Ground
10	DGND	P	Digital Ground

Table 2-13 Parallel Camera and UART2 Connector Pin-out (J5)

Note:

[1] Pin is being latched at boot to determine boot sequence. External drivers to this pin should be disabled in time of boot otherwise they may change the boot option and the SOM will not boot. Refer to VAR-SOM-MX7 datasheet for more details.

2.3.14 I2C and CAN Bus

The VAR-MX7CustomBoard exposes a CAN Bus interface is driven by an on board CAN Bus Transceiver on the connected to the VAR-SOM-MX7 CAN1 interface.
The VAR-MX7CustomBoard exposes the VAR-SOM-MX7 I2C interface. Both are exported to a standard to a standard 10 pin Header.

2.3.14.1 I2C and CAN Bus Connector Pin- out (J14)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	CANL1	DSI/O	CAN1 L Differential signal
2	CANH1	DSI/O	CAN1 H Differential signal
3	I2C1_SCL	O	I2C1 Clock signal
4	I2C4_SCL	O	I2C4 Clock signal
5	I2C1_SDA	IO	I2C1 Data signal
6	I2C4_SDA	IO	I2C4 Data signal
7	I2C2_SCL	O	I2C2 Clock signal
8	BASE_PER_3V3	P	Peripherals Power supply 3.3V
9	I2C2_SDA	IO	I2C2 Data signal
10	DGND	P	Digital Ground

Table 2-21 I2C and CAN Bus Connector Pin-out (J14)

2.3.15 ADC1, Analog mic, GPIO

The VAR-MX7CustomBoard exports the VAR-SOM-MX7 ADC1, Analog mic signals and optional GPIO's through a standard 10 pin Header.

2.3.15.1 ADC1, Analog mic, GPIO Pin-out (J7)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	BASE_PER_3V3	P	Peripherals Power supply 3.3V
2	TS_X+/ ADC1_IN3	AI	Touch Screen X Plus / ADC1 input 3[1], [2]
3	GPIO7_IO[10]	IO	GPIO7_IO[10] (used by on SOM Etehernet1) [3]
4	TS_X- / ADC1_IN2	AI	Touch Screen X Minus / ADC1 input 2[1], [2]
5	GPIO2_IO[26]	IO	GPIO2_IO[26] (used by on SOM Etehernet2) [4]
6	TS_Y+/ ADC1_IN1	AI	Touch Screen Y Plus / ADC1 input 1[1], [2]
7	MICBIAS	AP	Analog Microphone Bias
8	TS_Y- / ADC1_IN0	AI	Touch Screen Y Minus / ADC1 input 0[1], [2]
9	MICIN	AI	Analog Microphone In
10	DGND	P	Digital Ground

ADC1, Analog mic, GPIO Pin-out (J7)

Note:
[1] ADC1 signal is referenced to 1.8V.
[2] Pin is part of either: Resistive touch interface (when Resistive touch controller is assembled on SOM) or ADC1 interface (when Resistive touch controller is not assembled on SOM).
Refer to SOM datasheet for more information.
[3] Signal is available for usage only on SOMs with no Ethernet1 assembled. Refer to SOM datasheet for more information.
[4] Signal is available for usage only on SOMs with no Ethernet2 assembled. Refer to SOM datasheet for more information.

ADC2 and SPI2

The VAR-MX7CustomBoard exports the VAR-SOM-MX7 ADC2 and SPI2 signals through a standard 10 pin Header.

2.3.15.2 ADC2 and SPI2 Header Pin-out (J10)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	BASE_PER_3V3	P	Peripherals Power supply 3.3V
2	ADC2_IN0	AI	ADC2 input 0[1]
3	ECSPI2_SCLK	O	SPI Clock signal
4	ADC2_IN1	AI	ADC2 input 1[1]

5	ECSPI2_MISO	I	SPI MISO signal
6	ADC2_IN2	AI	ADC2 input 2[1]
7	ECSPI2_MOSI	O	SPI MOSI signal
8	ADC2_IN3	AI	ADC2 input 3[1]
9	ECSPI2_CS0	O	SPI Chip Select 0 signal
10	DGND	P	Digital Ground

Table 2-22 ADC2 and SPI2 Header Pin-out (J10)

Note:
[1] ADC2 signal is referenced to 1.8V.

2.3.16 UART3 and Digital Audio (SAI2)

The VAR-MX7CustomBoard exports the VAR-SOM-MX7 UART3 and SAI2 Digital audio signals through a standard 10 pin Header.
Note:
UART3 Interface is available on SOMs with no Wi-Fi module assembled.
SAI2 Interfaces is available on SOMs with no Bluetooth Audio assembled.
Refer to SOM datasheet for more information.

2.3.16.1 UART3 and Digital Audio (SAI2) Header Pin-out (J13)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	BT_UART3_RTS_B	I	UART3 RTS (used by on SOM Bluetooth)
2	SAI2_TX_BCLK	IO	SAI2 TX BCLK (used by on SoM Bluetooth Audio)
3	BT_UART3_CTS_B	O	UART3 CTS (Used by on SOM Bluetooth)
4	SAI2_TX_DATA	O	SAI2 TX DATA (used by on SoM Bluetooth Audio)
5	BT_UART3_RXD	I	UART3 RX (used by on SOM Bluetooth)
6	SAI2_RX_DATA	I	SAI2 RX Data (used by on SoM Bluetooth Audio)
7	BT_UART3_TXD	O	UART3 TX (used by on SOM Bluetooth)
8	SAI2_TX_SYNC	IO	SAI2 TX Sync (used by on SoM Bluetooth Audio)
9	SAI2_RX_SYNC	IO	SAI2 RX Sync (used by on SoM Bluetooth Audio)
10	SAI2_RX_BCLK	IO	SAI2 RX BCLK (used by on SoM Bluetooth Audio)

Table 2-23 UART3 and Digital Audio Header Pin-out (J13)

2.4 User Interfaces

2.4.1 LED Indications

2.4.1.1 Power-On LED (D25)

Led D25 indicates that the VCC_5V DC IN power rail of the VAR-MX7CustomBoard is on.

2.4.1.2 GP LEDs (D10)

LEDs D10 is a General purpose functionality LED controlled by VAR-SOM-MX7's GPIO.

2.4.2 Control Buttons

2.4.2.1 Boot Select (SW1, SW2)

The Boot select switches SW1, SW2 sets the VAR-SOM-MX7's boot source & sequence. Refer to the VAR-SOM-MX7 module data sheet for detailed Boot description.

SW1 Position	SW2 Position	Boot Source
OFF	OFF	External (SD card)
OFF	ON	Internal (NAND)
ON	OFF	Internal (eMMC)
ON	ON	---

Table 2-24 Boot Select modes (SW1,SW2)

2.4.2.2 User Buttons (SW3, SW4, SW5)

SW3, SW4, and SW5 are User Buttons connected to the VAR-SOM-MX7' GPIOs for general purpose. In Linux release they serve as Left, Enter, and Right Buttons respectively.

2.4.2.3 Reset Button (SW6)

A press on SW6 will perform a system hardware-reset.

2.4.2.4 ON/OFF Button (SW7)

The ON/OFF is Button supports:

1) Prolonged press (> 5 sec.) will result in ungraceful hardware shutdown similar to when software is unable to power Off the device.

2) Short press (<5 sec) will result in soft shutdown (SW shutdown)

3) Then, when in OFF state, momentary press (> 750ms) of button will cause restart (boot).

2.4.3 Power Input

The VAR-MX7CustomBoard is powered by a +5V power supply, connected either through a 2.0 mm power plug or alternatively through a 2 pin Terminal block.

2.4.3.1 DC-in Jack Pin-out (J24)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	DGND	P	Digital ground
2	DGND	P	Digital ground
3	VCC_5V	P	+5V power input
4	VCC_5V	P	+5V power input

Table 2-25 DC-in Jack Pin-out (J24)

2.4.3.2 DC-in 2 pin Terminal Block Pin-out (J25)

Pin #	VAR-MX7CustomBoard Signal	Type	Description
1	DGND	P	Digital ground
2	VCC_5V	P	+5V power input

Table 2-26 DC-in 2 pin Terminal Block Pin-out (J25)

2.4.3.3 RTC Backup Battery (JBT1)

The VAR-MX7CustomBoard features JBT1, a CR1225 battery holder for powering the On board ISL12057IUZ RTC Module.

3 Electrical Environmental Specifications

3.1 Absolute maximum electrical specifications

	Min	Max
Main Power supply, DC-IN	-0.3V	6

Table 3-1 Absolute maximum electrical specifications

3.2 Operational electrical specifications

	Min	Max
Main Power supply, DC-IN	4.8V	5.2V

Table 3-2 Operational electrical specifications

4 Environmental specifications

	Min	Max
Commercial operating temperature range	0^0C	+70^0C
MTBF	>10000hrs	
Shock resistance	50G / 20 ms	
Relative humidity, Operational	10%	90%
Relative humidity, Storage	5%	95%
Vibration	20G / 0 - 600 Hz	

Table 4-1 Environmental specifications

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7 Contact information

Headquarters

Variscite LTD
4, Hamelacha st.
Lod.
P.O.B 1121
Airport City, 70100
ISRAEL
Phone +972 (9) 9562910 • Fax +972 (9) 9589477

Tel: +972 (9) 9562910
Fax: +972 (9) 9589477

Sales: sales@variscite.com
Technical support: support@variscite.com

Website: www.variscite.com