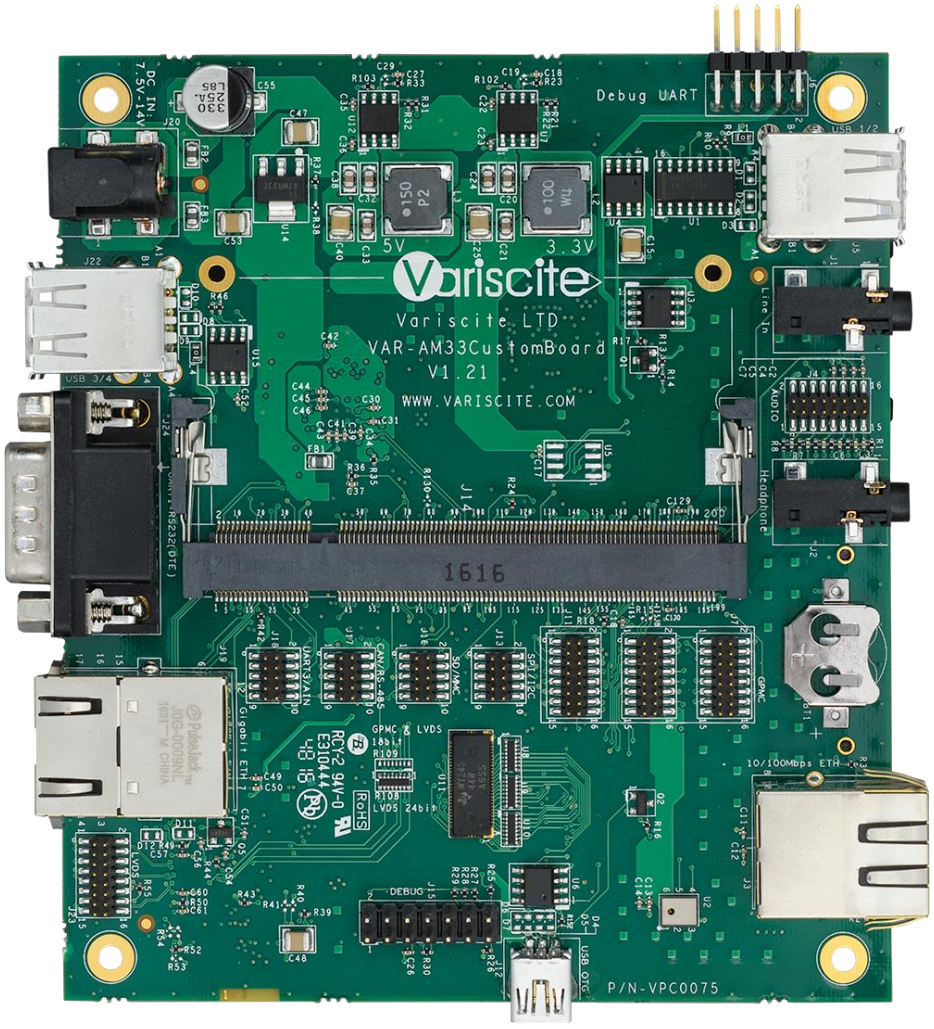
VARISCITE LTD

VAR-AM33CustomBoard Datasheet

Carrier board for VAR-SOM-AM33

V1.1/V1.2



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Variscite Ltd.
9 Hamelacha St.
Lod 70100
POB 1121
Israel

Revision History

Revision	Date	Notes
1.0	30/07/2012	Initial
1.02	27/08/2012	Block Diagram update
1.02A	27/09/2012	USB Port 1,2 NC
1.11A	02/12/2012	USB Port 1, 2 Bug fixed, connected. GPMC/RGMII/LCD MSB selection is done by resistor assembly option
1.12	05/03/2013	J23 Signals revised
1.13	20/05/2014	Top Side - Detailed View revised
1.14	28/03/2018	Corrected GPMC pinmux tables sections 2.4.10, 2.4.11

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1 Overview

This chapter gives a general overview of the VAR-AM33CustomBoard.

1.1 General Information

The VAR-AM33CustomBoard is a single board computer, utilizing all the VAR-SOM-AM33 System-on-Module features. For development and production, the VAR-AM33CustomBoard serves both as a complete development kit and an end-product, assembled according to your specifications at an optimized price-point.

1.1.1 Variscite Products Support

- VAR-SOM-AM33 System-on-Module

1.1.2 O.S. Support

- Linux BSP
- Windows Embedded Compact 7
- Android

1.1.3 Additional Information

Board schematics as well as a mechanical CAD data base are available for download from: www.variscite.com.

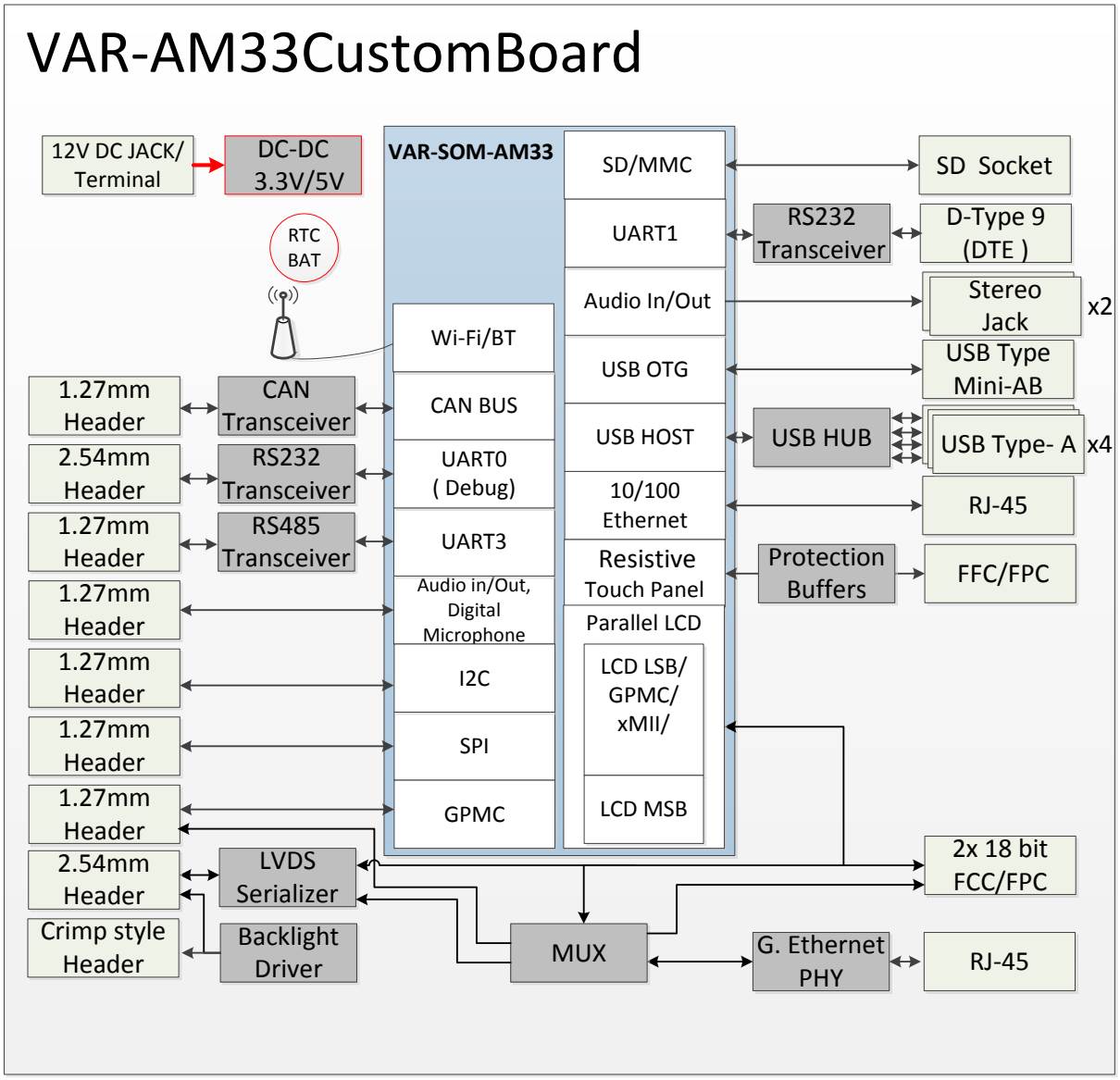
For further information contact Variscite support at: support@variscite.com.

1.2 VAR-AM33CustomBoard Features Summary:

- SO-DIMM 200-pin socket
  - Compatible with VAR-SOM-AM33
- Display
  - 2 x LCD interface connector compatible with 7" TFT display module (Resistive / Capacitive LCD)
  - 24-bit, 4 lanes, LVDS transmitter
- Touch Panel Interface
  - Resistive (4-wire) 4-pin FFC/FPC connector
  - Capacitive (I2C based) 10-pin FFC/FPC connector
- Ethernet
  - 10/100/1000BaseT – RJ45
  - 10/100BaseT – RJ45
- USB
  - 4 x USB 2.0 host - type A
  - USB 2.0 OTG - mini AB
- AUDIO
  - Headphones 3.5 mm jack
  - line in 3.5 mm jack
- SD card slot
- 2 x UART (RS232 levels)
  - DTE- DB9 male
  - Debug - IDC10 header
- CAN Bus - header
- RS485 - header
- JTAG
- Expansion connectors:
  - GPMC - Local Bus interface
  - McASP
  - SD/MMC interface
  - SPI
  - I2C
  - UART
  - Digital microphone
  - Audio in / out
  - GPIOs
- Power

- Power terminal / 2.5 mm DC jack options
- 7.5 V -14 V DC input
- RTC backup coin battery socket

1.3 Block Diagram

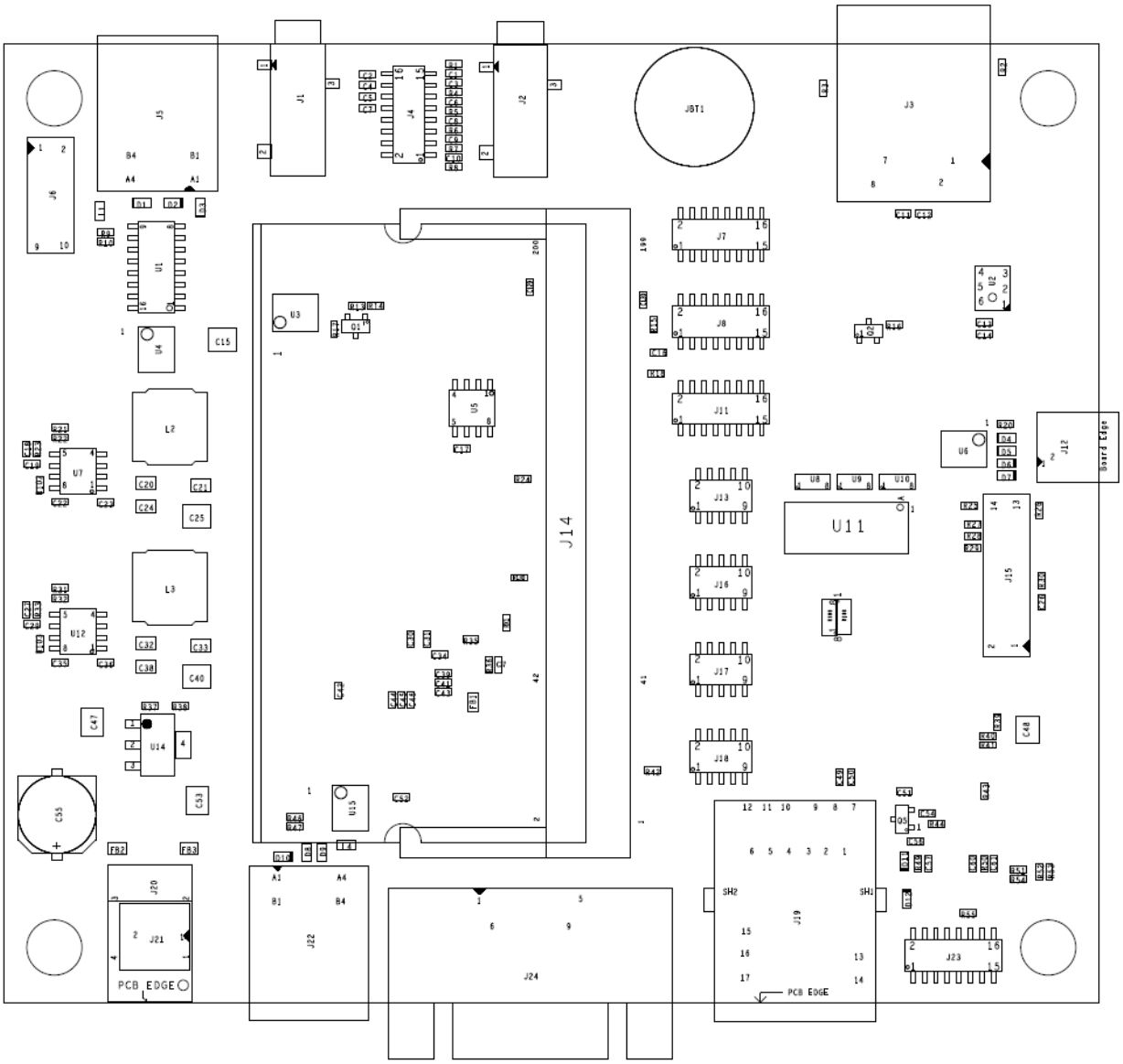


1.4 Board Layout

The VAR-AM33CustomBoard's physical dimensions are 120 x 105 mm.

Detailed CAD files are available for download from: www.variscite.com.

Top Side - Detailed View



1.5 VAR-AM33CustomBoard Connectors

The table below lists all available connectors on the VAR-AM33CustomBoard - refer to Chapter 2 for a more detailed description and the pin-out of each connector.

Ref	Function	Type
J1	Audio In	Audio Jack 3.5 mm
J2	Headphone Out	Audio Jack 3.5 mm
J3	10/100Mbps Port	RJ-45
J4	Audio	Header, 8 x 2, 1.27 mm
J5	USB Host, Ports 1/2	2 x USB TYPE A
J6	RS232 (Debug)	Header, 5 x 2
J7	GPMC	Header, 8 x 2, 1.27 mm
J8	GPMC	Header, 8 x 2, 1.27 mm
J11	GPMC	Header, 8 x 2, 1.27 mm
J12	USB OTG	USB Connector MINI AB
J13	SPI/I2C	Header, 5 x 2, 1.27 mm
J14	VAR-SOM-AM33 Connector	SO-DIMM200, 1.8 V
J15	JTAG	Header 7 x 2 ,2.54 mm
J16	SD MMC	Header, 5 x 2, 1.27 mm
J17	Serial COMM (CAN/RS485)	Header, 5 x 2, 1.27 mm
J18	Analog Inputs and UART3	Header, 5 x 2, 1.27 mm
J19	10/100/1000 Mbps Port	RJ-45
J20	VCC IN	Power Jack
J21	VCC IN	Terminal Block
J22	USB Host, Ports 3/4	2 x USB TYPE A
J24	RS232	CONN DB9 (male)
J23	LVDS Header	Header, 8 x 2, 1.27 mm
J25	MMC-SD	SDCARD Socket
J26	Resistive Touch Panel I/F	FFC/FPC 4-pin
J27	18-bit RGB LCD (Capacitive)	FFC/FPC 40-pin
J28	Capacitive Touch Panel I/F	FFC/FPC 10-pin
J29	18-bit RGB LCD (Resistive)	FFC/FPC 40-pin
JBT1	RTC Battery Holder	CR1225

Table 1 - 1 VAR-AM33CustomBoard Connectors

2 Detailed Description

2.1 Overview

This chapter details the VAR-AM33CustomBoard features and external interfaces, most are driven by the VAR-SOM-AM33. Please refer to the VAR-SOM-AM33 data sheet for more information regarding those interfaces.

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

Pin#:
Pin number of the specific connector

VAR-AM33CustomBoard Signal:
VAR-AM33CustomBoard schematic signal name

Type:
Pin Type & Direction:

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

Description:
Short pin functionality description

2.2 VAR-SOM-AM33 Interfaces

2.2.1 SO-DIMM 200 (J18)

The VAR-AM33CustomBoard features a SO-DIMM200 1.8 V standard connector compatible with the VAR-SOM-AM33 System-on-Module devices. Please refer to the VAR-SOM-AM33 module data sheet for a complete signals description and pin-out.

2.3 Standard External Interfaces

2.3.1 HOST USB (J5, J22)

The VAR-AM33CustomBoard supports four USB 2.0 host ports. All are driven by an on-board, 4-port, USB hub.

2.3.1.1 USB Host 1/2 Connector Pin-out (J5) - NC

Pin #	VAR-AM33CustomBoard Signal	Type	Description
A1	VCC_USB1	Power	5 V power supply,500 mA max.
A2	USB_HUB_DN1	DSI/O	USB data negative
A3	USB_HUB_DP1	DSI/O	USB data positive
A4	GND	Power	
B1	VCC_USB2	O	5 V power supply, 500 mA max.
B2	USB_HUB_DN2	DSI/O	USB data negative
B3	USB_HUB_DP2	DSI/O	USB data positive
B4	GND	Power	

Table 2 - 1 USB Host1/2 Connector Connector Pin-out (J5)

2.3.1.2 USB Host 2/3 Connector Pin-out (J22)

Pin #	VAR-AM33CustomBoard Signal	Type	Description
A1	VCC_USB4	Power	5 V power supply, 500 ma max.
A2	USB_HUB _DN4	DSI/O	USB data negative
A3	USB_HUB _DP4	DSI/O	USB data positive
A4	GND	Power	
B1	VCC_USB3	O	5 V power supply, 500 mA max.
B2	USB_HUB_DN3	DSI/O	USB data negative
B3	USB_HUB_DP3	DSI/O	USB data positive
B4	GND	Power	

Table 2 - 2 USB Host1/2 Connector Connector Pin-out (J22)

2.3.2 USB OTG (J12)

The VAR-AM33CustomBoard OTG is driven by the VAR-SOM-AM33 OTG interface.

2.3.2.1 USB OTG Connector Pin-out (J12)

Pin #	VAR-AM33CustomBoard Signal	Type	Description
1	OTG_VBUS	Power	5 V in/out (client/host)
2	USB_OTG_DN	DSI/O	USB data negative
3	USB_OTG_DP	DSI/O	USB data positive
4	USB_OTG_ID	I	USB OTG ID signal (‘1’ - device mode)
5	DGND	Power	

Table 2 - 3 USB OTG Connector Pin-out (J12)

2.3.3 SD Card (J25)

The SD card interface is driven by the VAR-SOM-AM33 SD/MMC0 interface. Refer to the VAR-SOM-AM33 module data sheet for a complete interface description.

2.3.4 SD Card Slot Connector Pin-out (J29)

Pin #	VAR-AM33CustomBoard Signal	Type	Description
1	MMC0_DAT3	DSI/O	MMC parallel data 3
2	MMC0_CMD	DSI/O	MMC command
3	GND	Power	
4	VCC_SD	Power	SD card VCC
5	MMC0_CKO	O	MMC clock
6	GND	Power	
7	MMC0_DAT0	DSI/O	MMC parallel data 0
8	MMC0_DAT1	DSI/O	MMC parallel data 1
9	MMC0_DAT2	DSI/O	MMC parallel data 2
10	MMC_CD	I	MMC card detect
11	SD_WP	I	MMC write protected
12	GND	Power	

Table 2 - 4 SD Card Slot Connector Pin-out (J29)

2.3.5 Ethernet (J3, J23)

The VAR-AM33CustomBoard features two Ethernet interfaces:

- 10/100/1000 Mbps

- 10/100 Mbps

Both Ethernet interfaces are exposed by a standard RJ45 Ethernet jack with integrated magnetics. The 10/100 Mbps Ethernet port is directly connected to VAR-SOM-AM33 on-board Ethernet PHY, while the fast Ethernet port is driven by on-board Gigabit internet PHY connected to the VAR-SOM-AM33 RGMII interface. Refer to the VAR-SOM-AM33 module data sheet for a complete interface description.

2.3.5.1 10/100/1000BaseT Connector Pin-out (J23)

<table>
<tr><th>Pin #</th><th>VAR-AM33CustomBoard Signal</th><th>Type</th><th>Description</th></tr>
<tr><td>1</td><td>VCC_3V3</td><td>Power</td><td></td></tr>
<tr><td>2</td><td>MDI_C-</td><td>DI/O</td><td>Bi-directional pair C negative</td></tr>
<tr><td>3</td><td>MDI_C+</td><td>DI/O</td><td>Bi-directional pair C positive</td></tr>
<tr><td>4</td><td>MDI_B+</td><td>DI/O</td><td>Bi-directional pair B positive</td></tr>
<tr><td>5</td><td>MDI_B-</td><td>DI/O</td><td>Bi-directional pair B negative</td></tr>
<tr><td>6</td><td>DGND</td><td>Power</td><td></td></tr>
<tr><td>7</td><td>Power</td><td>Power</td><td></td></tr>
<tr><td>8</td><td>MDI_D+</td><td>DI/O</td><td>Bi-directional pair D positive</td></tr>
<tr><td>9</td><td>MDI_D-</td><td>DI/O</td><td>Bi-directional pair D negative</td></tr>
<tr><td>10</td><td>MDI_A-</td><td>DI/O</td><td>Bi-directional pair A negative</td></tr>
<tr><td>11</td><td>MDI_A+</td><td>DI/O</td><td>Bi-directional pair A positive</td></tr>
<tr><td>12</td><td>DGND</td><td>Power</td><td></td></tr>
<tr><td>13</td><td>LED2</td><td>O</td><td>PHY LED2
<table>
<tr><th>LED2</th><th>LED1</th><th>Status</th></tr>
<tr><td>Off</td><td>Off</td><td>Link off</td></tr>
<tr><td>On</td><td>Off</td><td>1000 link no activity</td></tr>
<tr><td>Blinking</td><td>Off</td><td>1000 link activity</td></tr>
<tr><td>Off</td><td>On</td><td>100 link no activity</td></tr>
<tr><td>Off</td><td>Blinking</td><td>100 link activity</td></tr>
<tr><td>On</td><td>On</td><td>10 link no activity</td></tr>
<tr><td>Blinking</td><td>Blinking</td><td>10 link activity</td></tr>
</table></td></tr>
<tr><td>14</td><td>VCC_3V3</td><td>Power</td><td></td></tr>
<tr><td>15</td><td>LED1</td><td>O</td><td>PHY LED1 – see LED 2 description</td></tr>
<tr><td>16</td><td>VCC_3V3</td><td>Power</td><td></td></tr>
</table>

Table 2 - 5 10/100/1000Mbps RJ45 Connector Pin-out (J23)

2.3.5.2 10/100BaseT Connector Pin-out (J3)

Pin #	VAR-AM33CustomBoard Signal	Type	Description
1	ETH_TXDP	DSO	Tx pair positive
2	ETH_TXDN	DSO	Tx pair negative
3	ETH_RXDP	DIS	Rx pair positive
4	GND Capacitor	Power	
5	GND Capacitor	Power	
6	ETH_RXDN	DSI	Rx pair negative
7	NC		
8	DGND	Power	
9	Green LED cathode		Anode
10	LINKLED	O	Link LED
11	LINKSPEED	O	Speed LED
12	Yellow LED cathode		

Table 2 - 6 10/100 Mbps RJ45 Connector Pin-out (J3)

2.3.6 AUDIO (J2, J1)

The VAR-AM33 CustomBoard feature two 3.5 mm jacks for audio interfaces

- Headphone jack
- Line in

Both interfaces are driven by the VAR-SOM-AM33, on board AUDIO CODEC device. Additional audio signals are available on AUDIO header. Refer to the VAR-SOM-AM33 module data sheet for a complete interface description.

2.3.6.1 Headphone Jack Connector Pin-out (J2)

Pin #	VAR-AM33CustomBoard Signal	Type	Description
1	GND	AP	
2	HP_OUT_L	AI	Headphone out left
3	HP_OUT_R	AI	Headphone out right

Table 2 - 7 Headphone Jack Connector Pin-out (J2)

2.3.6.2 Line In Jack Connector Pin-out (J1)

Pin #	VAR-AM33CustomBoard Signal	Type	Description
1	GND	Power	
2	AUD_IN_R	AI	Line in right input

3	AUD_IN_L	AI	Line in left input

Table 2 - 8 Line In Jack Connector Pin-out (J1)

2.3.7 RS232 -DTE (J24)

The RS232 DTE interface is driven by the VAR-SOM-AM33 UART1 interface and a RS232 transceiver. Together with an on-board standard, male D-Type9 connector, this connector serves as a DTE interface for connecting third party DCE (i.e. modem) devices.

2.3.7.1 RS232 -DTE Connector Pin-out (J24)

Pin #	VAR-AM33CustomBoard Signal	Type	Description
1	NC		
2	UART1_RX_C	I	UART#1 receive
3	UART1_TX_C	O	UART#1 transmit
4	NC		
5	DGND	Power	
6	NC		
7	UART1_RTS_C	O	UART#1 RTS
8	UART1_CTS_C	I	UART#1 CTS
9	NC		
10	EARTH	Power	
11	EARTH	Power	

Table 2 - 9 RS232 DTE Connector Pin-out (J24)

2.4 DVK External Interfaces

This section describes the additional available interface, using nonstandard connectors. Those interfaces can be used for connecting third party hardware.
Most of those signals are exposed by a 1.27 mm 2 x 5 header, mates with any 1.27 mm receptacle
Connector example: Sullins Connector Solutions, LPPB052NFSS-RC
http://www.digikey.com/product-detail/en/LPPB052NFSS-RC/S9006E-05-ND/1786338 ,

Cable example: Samtec , FFSD-05-D-08.00-01-N
http://uk.farnell.com/samtec/ffsd-05-d-08-00-01-n/lead-1-27mm-idc-8in-10way/dp/1934656)

2.4.1 LCD (J27/J29)

2 x 18-bit LCD connectors, driven by the VAR-SOM-AM33 parallel LCD interface are exposed by a 40-pin FFC/FPC, 0.5 mm pitch connector. The connector pin-out is compatible with VAR-DVK-AM33 optional 7” LCD modules (resistive/capacitive).

2.4.1.1 LCD Connector Pin-out (Resistive) (J29)

Pin #	VAR-AM33CustomBoard Signal	Type	Description
1	VCC_5V	Power	VLED, 5V
2	VCC_5V	Power	VLED, 5V
3	BL_CTRL	O	Backlight brightness control
4	DGND	Power	
5	DGND	Power	
6	BASE_PER_3V3	Power	AM33CustomBoard peripherals VCC
7	BASE_PER_3V3	Power	AM33CustomBoard peripherals VCC
8	MODE	O	MODE
9	LCD_AC_BIAS_EN	O	Data enable
10	VSYNC	O	Vertical sync
11	HSYNC	O	Horizontal sync
12	DGND	Power	
13	LCD_DATA15	O	Blue bit 5
14	LCD_DATA14	O	Blue bit 4
15	LCD_DATA13	O	Blue bit 3
16	DGND	Power	
17	LCD_DATA12	O	Blue bit 2
18	LCD_DATA11	O	Blue bit 1
19	DGND	Power	
20	DGND	Power	
21	LCD_DATA10	O	Green bit 5
22	LCD_DATA9	O	Green bit 4
23	LCD_DATA8	O	Green bit 3
24	DGND	Power	
25	LCD_DATA7	O	Green bit 2
26	LCD_DATA6	O	Green bit 1
27	LCD_DATA5	O	Green bit 0
28	DGND	Power	
29	LCD_DATA4	O	Red bit 5
30	LCD_DATA3	O	Red bit 4
31	LCD_DATA2/SYSBOOT	Power	Red bit 3 / Boot source select control
32	DGND	Power	
33	LCD_DATA1	O	Red bit 2
34	LCD_DATA0	O	Red bit 1
35	DGND	O	Red bit 0
36	DGND	Power	
37	LCD_PCLK	O	Clock
38	DGND	Power	

Pin #	VAR-AM33CustomBoard Signal	Type	Description
39	LR	O	Left / right select
40	UD	O	Up / down select
41	DGND	Power	
42	DGND	Power	

Table 2 - 10 Resistive LCD Connector Pin-out (J29)

2.4.1.2 LCD Connector Pin-out (Capacitive) (J27)

Pin #	VAR-AM33CustomBoard Signal	Type	Description
1	UD	O	Up / down select
2	LR	O	Left / right select
3	NC		
4	BASE_PER_3V3	Power	AM33CustomBoard peripherals VCC
5	BASE_PER_3V3	Power	AM33CustomBoard peripherals VCC
6	BASE_PER_3V3	Power	AM33CustomBoard peripherals VCC
7	BASE_PER_3V3	Power	AM33CustomBoard peripherals VCC
8	NC		
9	LCD_AC_BIAS_EN	O	Data enable
10	DGND	Power	
11	DGND	Power	
12	DGND	Power	
13	LCD_DATA15	O	Blue bit 5
14	LCD_DATA14	O	Blue bit 4
15	LCD_DATA13	O	Blue bit 3
16	DGND	Power	
17	LCD_DATA12	O	Blue bit 2
18	LCD_DATA11	O	Blue bit 1
19	NC		
20	DGND	Power	
21	LCD_DATA10	O	Green bit 5
22	LCD_DATA9	O	Green bit 4
23	LCD_DATA8	O	Green bit 3
24	DGND	Power	
25	LCD_DATA7	O	Green bit 2
26	LCD_DATA6	O	Green bit 1
27	LCD_DATA5	O	Green bit 0
28	DGND	Power	
29	LCD_DATA4	O	Red bit 5
30	LCD_DATA3	O	Red bit 4
31	LCD_DATA2/SYSBOOT	Power	Red bit 3 / boot source select control

Pin #	VAR-AM33CustomBoard Signal	Type	Description
32	DGND	P	
33	LCD_DATA1	O	Red bit 2
34	LCD_DATA0	O	Red bit 1
35	NC	O	Red bit 0
36	DGND	P	
37	NC		
38	LCD_PCLK	Power	DCLK
39	HSYNC	O	Horizontal sync
40	VSYNC	O	Vertical sync
41	DGND	Power	
42	DGND	Power	

Table 2 –11 Capacitive LCD Connector Pin-out (J27)

2.4.2 LVDS Interface Connector (J23)

The VAR-AM33CustomBoard LVDS interface, compatible with a 24-bit, four lane LVDS interface LCDs, is driven by an on-board TI SN75LVDS83B LVDS transmitter. LVDS data is sourced from the VAR-SOM-AM33 parallel RGB LCD interface. Additional to the LVDS signals, is the LVDS connector feature backlight driver, supporting up to 32 V backlight LEDs.

2.4.3 LVDS Signals (J23)

Pin #	Signal	Type	Description
1	RXIN0-	DO	LVDS lane 0, negative signal
2	RXIN2-	DO	LVDS lane 2, negative signal
3	RXIN0+	DO	LVDS lane 0, positive signal
4	RXIN2+	DO	LVDS lane 2, positive signal
5	DGND	Power	
6	DGND	Power	
7	RXIN1-	DO	LVDS lane 1, negative signal
8	CLKIN-	DO	LVDS clock 0, positive signal
9	RXIN1+	DO	LVDS lane 1, positive signal
10	CLKIN+	DO	LVDS clock, negative signal
11	VCC_5V	Power	
12	BASE_PER_3V3	Power	AM33CustomBoard peripherals VCC
13	LED_BL_K	Power	
14	RXIN3-	DO	LVDS lane 3, positive signal
15	LED_BL_A	O	Backlight brightness control
16	RXIN3+	DO	LVDS lane 3, negative signal

Table 2 - 12 LVDS Connector Connector Pin-out (J23)

2.4.4 Touch Panel Connectors (J26/J28)

The VAR-AM33CustomBoard supports two touch panel interfaces:

- Resistive touch panels
- Capacitive touch panels

Each supporting the mechanical and electrical interface required by the matching LCD module

2.4.4.1 Resistive Touch Panel Connector Pin-out (J26)

Pin #	VAR-AM33CustomBoard 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	EARTH	Power	
6	EARTH	Power	

Table 2 - 13 Resistive Touch Panel Connector Pin-out (J26)

2.4.4.2 Capacitive Touch Panel Connector Pin-out (J28)

Pin #	VAR-AM33CustomBoard Signal	Type	Description
1	DGND	Power	
2	BASE_PER_3V3	Power	AM33CustomBoard peripherals VCC
3	I2C0_SCL	O	I2C CLK
4	NC		
5	I2C0_SDA	IO	I2C DATA
6	NC		
7	BASE_PER_3V3	Power	AM33CustomBoard peripherals VCC
8	NC		
9	GPIO_0_3	I	Pen up interrupt
10	DGND	Power	
11	DGND	Power	
12	DGND	Power	

Table 2 - 14 Capacitive Touch Panel Connector Pin-out (J28)

2.4.5 RS232 - Debug (J6)

The RS232 debug port is driven by the VAR-SOM-AM33 UART1 interface and a RS232 transceiver. Exposed by a 10-pin IDC header, this port can be connected to a DTE device (ex. PC) using a standard cable. Note that this port is usually serves as a low level software debug port.

2.4.5.1 RS232 -Debug Connector Pin-out (J6)

Pin #	VAR-AM33CustomBoard Signal	Type	Description
1	NC		
2	UART0_RX_C	I	UART0 receive
3	UART0_TX_C	O	UART0 transmit
4	NC		
5	DGND	P	
6	NC		
7	UART0_RTS_C	O	UART0 RTS
8	UART0_CTS_C	I	UART0 CTS
9	NC		
10	EARTH	P	
11	EARTH	P	

Table 2 - 15 RS232 – Debug Connector Pin-out (J6)

2.4.6 SD/MMC1 (J16)

SD/MMC3 expansion connector pins are directly connected to the VAR-SOM-AM33 pins. Note that the signals are shared with an on-board Wi-Fi module and can't be used if the Wi-Fi module is enabled.

2.4.6.1 SD/MMC Header Pin Out (J16)

Pin #	VAR-AM33CustomBoard Signal	VAR-SOM-AM33 PIN
1	MMC1_CLK	151
2	BASE_PER_3V3	AM33CustomBoard peripherals VCC
3	MMC1_CMD	149
4	WAKEUP	109
5	GPMC_AD8_MMC1_DAT0	154
6	GPMC_AD9_MMC1_DAT1	152
7	GPMC_AD11_MMC1_DAT3	148
8	GPIO_3_8/RS485_TX_EN	160
9	GPMC_AD10_MMC1_DAT2	150
10	DGND	

Table 2 - 16 SD/MMC1 Connector Pin-out (J16)

2.4.7 AUDIO (J4)

2.4.7.1 AUDIO Header Pin-out (J4)

The audio connector exposes all the audio signals, (except line-in and headphone–out, available on the audio jacks) . Those signals are driven by VAR-SOM-AM33 audio codec. Refer to the VAR-SOM-AM33 module data sheet for a complete interface description.

Pin #	VAR-AM33CustomBoard Signal	Type	Description
1	AUD_GND	Power	
2	MICBIAS	O	Analog microphone BAIS
3	MIC_IN_R	AI	Analog microphone input
4	DMIC_DATA	I	Digital microphone interface - data
5	MIC_IN_L	AI	Analog microphone input
6	DMIC_CLK	O	Digital microphone clock
7	AUD_GND	Power	
8	AUD_GND	Power	
9	LINEOUT_LM	AO	Line out left '-'
10	LINEIN2_RM	AO	Line in right '-'
11	LINEOUT_LP	AO	Line out left '+'
12	LINEIN2_RP	AO	Line in left '+'
13	LINEOUT_RM	AO	Line out right '-'
14	LINEIN2_LM	AO	Line in left '-'
15	LINEOUT_RP	AO	Line out right '+'
16	LINEIN2_LP	AO	Line in left '+'

Table 2 - 17 Audio Connector Pin-out (J4)

2.4.8 Analog Inputs & UART3 (J18)

VAR-SOM-AM33 analog to digital input / UART3 Rx, Tx interface. Both interfaces are directly connected to the VAR-SOM-AM33 pins. Refer to the VAR-SOM-AM33 module data sheet for a complete interface description.

2.4.8.1 Analog Inputs & UART3 (J18)

Pin #	VAR-AM33CustomBoard Signal	VAR-SOM-AM33 PIN
1	DGND	
2	DGND	
3	AIN4	32
4	AIN6	29
5	AIN5	34
6	AIN7	31

7	DGND	
8	DGND	
9	UART3_RXD	171
10	UART3_TXD	173

Table 2 - 18 Analog Inputs & UART3 Pin-out (J7)

2.4.9 SPI1/I2Cx (J13)

SPI1/I2Cx expansion connector pins are directly connected to the VAR-SOM-AM33 pins. Refer to the VAR-SOM-AM33 module data sheet for a complete interface description.

2.4.9.1 SPI1/I2Cx Connector Pin-out (J13)

Pin #	VAR-AM33CustomBoard Signal	VAR-SOM-AM33 PIN
1	BASE_PER_3V3	AM33CustomBoard peripherals VCC
2	SPI1_SCLK	167
3	I2C1_SDA	104
4	SPI1_D0/UART0_CTSN	163
5	I2C1_SCL	106
6	SPI1_D1/UART0_RTSN	165
7	I2C0_SDA	174
8	SPI1_CS0	161
9	I2C0_SCL	172
10	DGND	

Table 2 - 19 SPI1/I2Cx Connector Pin-out (J13)

2.4.10 GPMC (J7, J11, J8)

GPMC expansion connector pins are directly connected to the VAR-SOM-AM33. Refer to the VAR-SOM-AM33 module data sheet for a complete interface description.

2.4.11 GPMC 1 Connector Pin-out (J7)

Pin #	VAR-AM33CustomBoard Signal	VAR-SOM-AM33 PIN
1	GPMC_A0	44
2	BASE_PER_3V3	AM33CustomBoard peripherals VCC
3	GPMC_A5	53
4	GPMC_A7	55
5	GPMC_A6	50
6	GPMC_A8	54
7		
8	GPMC_WAIT0	63

9	GPMC_A4	48
10	GPMC_A9	59
11	GPIO3_10/GETH_EN	70
12	GPMC_A11	61
13	GPIO3_4	72
14	GPMC_A10	56
15	DGND	
16	GPMC_AD15	87

Table 2 - 20 GPMC 1 Connector Pin-out (J8)

2.4.11.1 GPMC 2 Pin-out (J11)

Pin #	VAR-AM33CustomBoard Signal	VAR-SOM-AM33 PIN
1	GPMC_AD0	78
2	BASE_PER_3V3	
3	GPMC_AD1	77
4	GPMC_ADVN_ALE	166
5	GPMC_AD2	80
6	GPMC_BE0N_CLE	168
7	GPMC_AD3	79
8	GPMC_OEN_REN	162
9	GPMC_AD4	82
10	GPMC_A3	51
11	GPMC_AD5	81
12	GPMC_A2	46
13	GPMC_AD6	84
14	GPMC_A1	49
15	DGND	
16	GPMC_AD7	83

Table 2 - 21 GPMC 2 Connector Pin-out (J11)

2.4.11.2 GPMC 3 Connector Pin-out (J8)

Pin #	VAR-AM33 AM33CustomBoard Signal	VAR-SOM-AM33 PIN
1	DGND	
2	GPMC_WAIT0	63
3	GPMC_AD9	152 [1]
4	GPMC_AD8	154 [1]
5	GPMC_AD10	150 [1]
6		
7	GPMC_AD14	88

8	GPMC_WEN	164
9	GPMC_AD13	85
10	GPMC_BE1N\MMC_CD	58
11	GPMC_AD11	148[1]
12	GPMC_CSN3	47
13	GPMC_AD12	86
14	GPMC_CLK	76
15	NC	
16	BASE_PER_3V3	AM33CustomBoard peripherals VCC

Table 2 - 22 GPMC 3 Connector Pin-out (J8)

[1] RGMII2 \ GPMC Mux Depend

2.4.12 JTAG (J15)

JTAG expansion connector pins are directly connected to the VAR-SOM-AM33 pins. Refer to the VAR-SOM-AM33 module data sheet for a complete interface description.

2.4.13 JTAG Connector Pin-out (J15)

Pin #	VAR-AM33CustomBoard Signal	VAR-SOM-AM33 PIN
1	JTAG_TMS	40
2	JTAG_TRSTN	39
3	JTAG_TDI	38
4	DGND	
5	AM33CustomBoard peripherals VCC	
6	NC	
7	JTAG_TDO	41
8	DGND	
9	JTAG_TCK	43
10	DGND	
11	JTAG_TDI	38
12	DGND	
13	Pull up to AM33CustomBoard peripherals VCC	
14	Pull Up AM33CustomBoard peripherals VCC	
15	JTAG_TMS	40
16	JTAG_TRSTN	39
17	JTAG_TDI	38
18	DGND	

Table 2 - 23 JTAG Connector Pin-out (J15)

2.5 User Interfaces

2.5.1 Resistor assembly options (Panasonic EXB-2HVR000)

2.5.1.1 Ethernet / GPMC Selection

R104 & R105 resistor networks assembly (by default) connects RGMII signals. If GPMC interface is required, R106 & R107 should be assembled instead of R104 & R105.

2.5.1.2 LCD /GPMC Selection

R108 resistor network assembly (by default) connects LCD MSB signals. If GPMC interface is required, R109 should be assembled instead of R108.

2.5.2 LED Indications

2.5.2.1 Power On LED

D21 indicates that the 5 V power rail of the VAR-SOM-AM33 is on.

2.5.3 Control Buttons

2.5.3.1 Reset Button (SW2)

System Hardware-reset

2.5.3.2 Boot Select (SW3)

The boot select switch sets the VAR-SOM-AM33 boot source and sequence. Refer to the VAR-SOM-AM33 module data sheet for a detailed description.

Position	Logic Level	Boot Source
Released	'0'	Internal
Pressed	'1'	External (MMC)

Table 2 - 24 Boot Select Switch Modes

2.5.3.3 User button (SW4)

General purpose button, to be used by user application. In android release the user button is used as "back"

2.5.4 Power Input (J20/J21)

The VAR-AM33CustomBoard is powered by a 7 V to 14 V DC power supply, using one of the connectors below (assembly option).

2.5.4.1 DC-in Jack (J20)

The DC-in power jack is compatible with a standard 2.5 mm / 5.5 mm power plug.

2.5.4.2 Terminal Block (J21)

A Terminal Block can be assembled if a DC jack is not required

Pin #	Signal
1	PWR_IN
2	PWR_IN
3	GND
4	GND

Table 2 - 25 Terminal Block Connector Pin-out (J24)

2.5.4.3 Terminal Block (J25)

Pin #	Signal
1	PWR_IN1
2	GND

Table 2 - 26 Terminal Block Connector Pin-out (J25)

2.5.4.4 RTC Backup Battery (JBT1)

The VAR-AM33 features a CR1225 battery holder powering the VAR-SOM-AM33 RTC backup supply rail.

3 Electrical Environmental Specifications

3.1 Absolute Maximum Electrical Specifications

	Min	Max
Main Power Supply DC-IN	-0.3 V	23 V
External Interfaces	Unless otherwise specified, refer to the VAR-SOM-AM33 data sheet	

Table 3 - 1 Absolute Maximum Electrical Specifications

3.2 Operational Electrical Specifications

	Min	Max
Main Power supply, DC-IN	7V	14V

External Interfaces	Unless otherwise specified refer to VAR-SOM-AM33 data sheet

Table 3 - 2 Operational Electrical Specifications

4 Environmental Specifications

	Min	Max
Commercial Operating Temperature Range	0 ^{0}C	+70 ^{0}C
Extended Operating Temperature Range	-20 ^{0}C	+70 ^{0}C
Industrial Operating Temperature Range	-40 ^{0}C	+85 ^{0}C
MTBF	10000 hrs >	
Shock Resistance	50 G/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.

Variscite Ltd.
9 Hamelacha St.
Lod 70100
POB 1121
Israel

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

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

Corporate Website: www.variscite.com