SoM-210ES

SoM 200-pin Carrier Board

User Manual

REV. 1.0

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1 SOM-210 Product Summary

Features

- **200 Pin SODIMM SoM Connector**

- **10/100BaseT Ethernet**

- **3 Serial ports with handshake**

- **2 USB 2.0 Host ports with Type A connectors and access to an additional Host port**

- **Battery for Real Time Clock**

- **MicroSD Flash Card Interface**

- **1 Audio Beeper**

- **General purpose I/O connector to give access to SoM peripherals lines such as SPI, I2S, Timer/Counters and Pulse Width Modulation (PWM) ports**

- **WQVGA LCD (480 x 272) Resolution with LED Backlight and 4-Wire Resistive Touch Screen**

- **Software Controlled LCD Backlight On/Off & Brightness**

- **FREE Eclipse IDE with GCC & GDB development tools**

- **Linux BSP and SDK available**

- **WinCE 6.0 BSP and SDK available**

1.1   Specifications

LCD

- **Display Type:** 4.3" TFT Color LCD
- **Resolution:** 400 x 272 WQVGA @ 256K Colors
- **Dot pitch:** 0.66mm x 0.198mm
- **Luminance:** 400 (cd/m²) typical
- **Contrast Ratio:** 500 typical
- **Viewing Angle:** 70° typical
- **Brightness:** Software controlled
- **Backlight:** White LED (10 LEDS)

Touchscreen

- **Type:** 4 Wire Analog Resistive
- **Resolution:** Continuous
- **Light Transparency:** 80%
- **Controller:** Resident on SoM
- **Driver:** WinCE, Linux
- **Durability:** Over one million touches

Ethernet interface

- **Ethernet Type:** 10/100 Base-T Ethernet
- **Ethernet Interface:** On-Board RJ-45 connector

Solid-state Flash Disk

- **Removable:** 8+ GB of SD, MMC, or SDHC Flash Disk

Mechanical and Environmental

- **Dimensions:** 4.8 " L x 3.0" W x 1.2" H
- **Weight:** 5.7 oz.
- **Power Supply Voltage:** +5V DC.
- **Power Consumption:** typical <~1.0A. @ 5V DC.
- **Operating Temperature**: 0 ~ 60° C (32 ~ 140° F)

Standard Parts Inventory

- SOM-210 Assembly with 4.3" Touchscreen
- Molded plastic LCD mounting bracket and standoffs
- Three Serial Port cables
- CDROM with manuals, schematics, and drivers

2 SOM-210 Product Details

2.1 Jumper Configuration & Connector Descriptions

The SOM-210 comes factory configured. In the event that jumpers need to be verified or modified, this section provides the information required, including instructions on setting jumpers and connecting peripherals, switches and indicators. Be sure to read all the safety precautions before you begin any configuration procedure. See Appendix A for connector pinouts and Appendix B for Jumper Settings. Note that the position of the Jumpers may be defined by the SoM that is being used. Consult the SoM manual for further details.

Table 1: Jumpers

Label	Function	Default
JB1	Boot Source Selection	Position A
JB2	Boot Source Selection	Position A

Table 2: Connectors

Label	Function
JK1	Ethernet
JK2	USB C
JK3	USB A
JK4	5v power barrel jack
HDR1	Power
HDR2	I/O Interface
HDR3 COM C	COM 3 Serial Port
HDR4 COM B	COM 2 Serial Port
HDR5 COM A	COM 1 Serial Port
HDR6	USB Host A & B
SOK1	200 pin SOM Socket
SOK2	MicroSD Card Socket
SOK3	LCD &Touch Interface Cable Socket

2.2   Power Connectors

The SOM-210 provides two power connectors. HDR4 is a standard four-pin type, PC floppy disk power connector that mates with standard floppy disk drive power connectors. Using this power input provides for a more rugged/industrial locking connection. JK4 is a standard 5.5mm barrel jack with an inner diameter of 2.1mm with a center V+ connection. This jack allows for easy connection to a wall mount power supply (EMAC part number PER-PWR-00032). The SOM-210's power input uses a switching regulator and allows a voltage input of +5V DC.

The pinout for the J1 power connector is as follows:

Pin	Signal
1	+5V DC
2	Chassis GND
3	Chassis GND
4	+12V DC (unused)

2.3   Ethernet

The SOM-210 provides 10/100 Base-T full duplex Ethernet and uses a standard RJ-45 connector. It can be connected straight to a hub or another computer via a crossover Ethernet cable. The Ethernet MAC & PHY are integrated into the SoM processor module. Activity and Link LEDs are integrated into the RJ45 connector.

2.4   Serial Ports

The SOM-210 is equipped with three serial ports, all of which terminate to 10-pin header connectors (see table 2, 3, & 4 below). Three 10-pin header-to-male DB9 connector cables are provided, giving easy access to these ports. Baud rate, stop bits, etc. are all programmable for each port via software.

COM A is an RS232 compatible port with a full complement of handshaking lines allowing it to communicate with modems and other devices requiring hardware flow control.

COM B is an RS232 port. This port offers the RTS and CTS handshake lines.

COM C can be configured to RS232, RS422, and RS485 via four software controlled port pins (see table 1 below). To select RS232 set SoM pin 109 & 120 Low and pin 118 & 119 High (this is the default). For RS422 set SoM pin 109 & 120 High and pin 118 & 119 Low. To select RS485, selectively set SoM pin 109 & 119 as required while keeping pin 118 Low.

When using COM C in the RS422/485 mode, a terminating resistor (~120 Ohm) is recommended on the two far ends of the network.

Table 1

SODIMM Pin#	SoM Pin Name	Function
109	COMD_RTS	RS422/485 Tx Enable
118	GPIO4	~RS232 Shutdown
119	GPIO5	~RS422/485 Rx Enable
120	GPIO6	~RS232 Enable

Table 2 (COM A Pinout)

#	Pin Description for 10-Pin Header	Pin Description for DB9 Connector
1	DCD	DCD
2	DSR	RxD
3	RxD	TxD
4	RTS	DTR
5	TxD	GND
6	CTS	DSR
7	DTR	RTS
8	RI	CTS
9	GND	RI
10	NC	-

Table 3 (COM B Pinout)

#	Pin Description for 10-Pin Header	Pin Description for DB9 Connector
1	NC	NC
2	NC	RxD
3	RxD	TxD
4	RTS	NC
5	TxD	GND
6	CTS	NC
7	NC	RTS
8	NC	CTS
9	GND	NC
10	NC	-

Table 4 (COM C Pinout)

#	Pin Description for 10-Pin Header	Pin Description for DB9 Connector
1	422/485 TX-	422/485 TX-
2	NC	232 RX, 422/485 TX+
3	232 RX, 422/485 TX+	232 TX, 422/485 RX+
4	RTS	422/485 RX-
5	232 TX, 422/485 RX+	GND
6	CTS	NC
7	422/485 RX-	RTS
8	NC	CTS
9	GND	NC
10	NC	-

2.5   USB Host Ports

The SOM-210 provides two, USB 2.0 Host ports, USB PortA and PortC, which can be accessed from the on-board USB connectors JK3 and JK2.

In addition to the two USB PortA and PortC Host ports, the SOM-210 provides access to an additional, USB 2.0 Host port. USB PortA and PortB can be accessed from the on-board USB connector HDR6. EMAC can provide an optional cable (CAB-40-004) to access these ports.

All of the USB ports are equipped with 500mA re-settable Polyfuses. If a USB Device tries to draw more than 500mA from the port, the fuse will open until the device is unplugged or its current requirement is reduced. There is no software provision for shutting down power to the Ports or detecting when a port is drawing too much current.

Note: When sizing a power supply, make sure to allow for USB Device consumption. A device can potentially draw 500mA; therefore these devices could use a total of up to 1.5 amps of power when using all 3 ports.

2.6   Audio Port (option on Rev1 and greater boards)

The SOM-210 provides Audio Line Out and Line In capability through a 10-pin 2mm header. A special cable converts the signals present on the header to two miniature audio jacks. The processor interfaces to the Audio CODEC through its I^2S interface. Command control of the CODEC is done using the processor's SPI interface. The CODEC is the Cirrus CS4271, which is a high performance 24-bit Stereo CODEC offering superior sound quality.

Both the input and output are line level. You will probably not be able to drive an unamplified speaker although standard headphones will work. Likewise, an un-amplified microphone probably will not work as an input although the line out of a CD player will work.

2.7   LCD Brightness Control
The SOM-210 offers LCD brightness control that can change the brightness of the LCD via software. The LCD utilizes LED backlighting. The board provides the backlight with approximately 30 volts at about 20mA. The processor provides a PWM that is used to drive the LCD backlight. Changing the duty-cycle of the PWM directly affects the brightness of the LCD. In addition, the backlight can be turned off by reducing the PWM rate to 0. This allows screensaver software to automatically turn off the backlight when the unit is not being used and to automatically turn it back on when the touchscreen is touched.

2.8   MicroSD Card Socket
The SOM-210 provides a high capacity MicroSD socket. This socket is hot-swappable and can accept a wide variety of Flash Cards. A green activity light (LED LD2) is located towards the left side of the socket. When the processor is accessing the Flash card, this LED will be lit and the card should not be removed at this time. A card that is written to by the SOM-210 can be read by another computer using an MicroSD card reader. The MicroSD interface is compatible with Standard and High Capacity MicroSD cards.

2.9   Keyboard/Mouse
The SOM-210 does not provide a PS/2 type keyboard/mouse interface. However, a USB keyboard and mouse can be used if required.

2.10   Analog Inputs
The analog inputs are available on HDR2 (see table 5 below) and are labeled as analog_04, analog_05, analog_06 and analog_07. These may or may not be supported by the SoM plugged into this carrier.

2.11 I/O Expansion

The Processor used by the SOM-210 provides a number of unused I/O lines. The SOM-210 provides access to these lines on connector HDR2. This 30-pin dual row header contains GPIO lines, SPI bus, I^{2}C bus, A/D lines, interrupts, and power pins. Signal names listed in the table below are the SoM names as defined in the SoM 200 pin specification.

Pin	Signal	Pin	Signal
1	GND	2	3.3V
3	CANRX	4	CANTX
5	I2DAT	6	I2CLK
7	RESET_OUT	8	SPI_MI
9	SPI_CK	10	SPI_MO
11	SPI_CS1	12	SPI_CS0
13	SPI_CS3/FRM	14	SPI_CS2
15	AUD_DOUT	16	AUD_MCLK
17	ANALG_05	18	AUD_SCLK
19	ANALG_07	20	AUD_DIN
21	ANALG_04	22	AUD_LRCLK
23	GPIO12	24	GPIO11
25	ANALG_06	26	GPIO13
27	GPIO15	28	IRQA
29	3.3V	30	GND

2.12 Real-Time Clock

The SOM-210 is equipped with an external battery for backing up the module's Real-Time Clock (RTC). Drivers to access the RTC are included in the operating systems.

2.13 Reset

The SOM-210 provides a Reset Button (PB1). Pressing this button will cause the system to reset.

3 Software

3.1 Introduction

Whichever module is used in the SOM-210 can be programmed in a variety of languages and utilize a variety of Operating Systems. There are a number of free compilers, interpreters, and assemblers available allowing the processor module to be programmed in C, BASIC, or Assembly languages. EMAC has Board Support Packages available for Linux and Windows CE. For more information on these particular Operating Systems, contact EMAC, Inc.

For more information on Software, see the module's User's Manual.

Note: All of the links in this document are subject to change. Please contact EMAC for updated link locations if necessary.

4 Appendix A: *Connector Pinouts*

4.1 Ethernet 10/100 Base-T connector (JK1)

Pin	Signal
1	XMT+
2	XMT-
3	RCV+
4	N/C
5	N/C
6	RCV-
7	N/C
8	N/C

4.2 USB Host connector Port A & C (JK3 and JK2)

4.2.1 PortA (JK3)

Pin	Signal
1	USB_PWR (5V DC)
2	USB_Data-
3	USB_Data+
4	GND

4.2.2 PortC (JK2)

Pin	Signal
1	USB_PWR (5V DC)
2	USB_Data-
3	USB_Data+
4	GND

4.3 USB Dual Host header connector (HDR6)

Pin	Signal	Pin	Signal
1	USB_A _ VBUS	2	USB_B _VBUS
3	USB_A _HOST-	4	USB_B _HOST-
5	USB_A _HOST+	6	USB_B _HOST+
7	GND	8	GND
9	NC	10	NC

4.4 Power Jack (JK4)

Pin	Signal
Center	5V DC
Barrel	GND

4.5 Power Connector (HDR1)

Pin	Signal
1	5V DC
2	GND
3	GND
4	+Vin

4.6 MicroSD Socket (SOK2)

Pin	Signal
1	DAT2
2	CD/DAT3
3	CMD
4	VCC (3.3V)
5	SCLK
6	GND
7	DAT0
8	DAT1
9	SD Card Detect
10	GND

4.7 LCD/Touch/Backlight (SOK3)

Pin	Signal
FN1	GND
1	LED-
2	LED+
3	GND
4	VCC
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	CLK
31	DISP ON/OFF
32	NC
33	NC
34	DATA ENABLE
35	NC
36	GND
37	TCHSCR X1 [RE]
38	TCHSCR Y1 [BE]
39	TCHSCR X2 [LE]
40	TCHSCR Y2 [TE]
FN2	GND

4.8 COMA RS-232 Serial Port (HDR5)

Pin	HD3 Signal	DB9 Signal
1	DCD	DCD
2	DSR	RxD
3	RxD	TxD
4	RTS	DTR
5	TxD	GND
6	CTS	DSR
7	DTR	RTS
8	RI	CTS
9	GND	RI
10	NC	-

4.9 COMB RS-232 Serial Port (HDR4)

Pin	HD3 Signal	DB9 Signal
1	NC	NC
2	NC	RxD
3	RxD	TxD
4	RTS	NC
5	TxD	GND
6	CTS	NC
7	NC	RTS
8	NC	CTS
9	GND	NC
10	NC	--

4.10 COMC RS-232/422/485 Serial Port (HDR3)

Pin	HD3 Signal	DB9 Signal
1	422/485 TX-	422/485 TX-
2	NC	232 RX, 422/485 TX+
3	232 RX, 422/485 TX+	232 TX, 422/485 RX+
4	RTS	422/485 RX-
5	232 TX, 422/485 RX+	GND
6	CTS	NC
7	422/485 RX-	RTS
8	NC	CTS
9	GND	NC
10	NC	-

4.11 Misc. I/O (HDR2)

Pin	Signal	Pin	Signal
1	GND	2	3.3V
3	CANRX	4	CANTX
5	I2DAT	6	I2CLK
7	RESET_OUT	8	SPI_MI
9	SPI_CK	10	SPI_MO
11	SPI_CS1	12	SPI_CS0
13	SPI_CS3/FRM	14	SPI_CS2
15	AUD_DOUT	16	AUD_MCLK
17	ANALG_05	18	AUD_SCLK
19	ANALG_07	20	AUD_DIN
21	ANALG_04	22	AUD_LRCLK
23	GPIO12	24	GPIO11
25	ANALG_06	26	GPIO13
27	GPIO15	28	IRQA
29	3.3V	30	GND

5 Appendix B: *Jumper Settings*

```
JB1    Boot Source Selection
       Jumper         Position           Setting
       Pins 1 & 2   A                    Serial Boot Loader Download
       Pins 2 & 3*  B                    Normal Boot from NOR Flash

* Default setting


JB2    Boot Option Selection

       Jumper         Position           Setting
       Pins 1 & 2   A                    Not Used
       Pins 2 & 3*  B                    Not Used

* Default Setting
```

6   Appendix C: *Mechanical drawing with dimensions*