SoM-212ES

SoM 200-pin Carrier Board

User Manual

REV. 1.0

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1 SOM-212 Product Summary

Features

- **200 Pin SODIMM SoM Connector**
- **10/100BaseT Ethernet**
- **4 Serial ports with handshake**
- **Dual USB Host**
- **USB OTG Host/Device Port**
- **CAN 2.0B Port**
- **Battery for Real Time Clock**
- **MicroSD Flash Card Interface**
- **1 Audio Beeper**
- **General purpose I/O connector to give access to SoM peripherals such as SPI, I2S & Timer/Counters.**
- **WQVGA LCD (480 x 272) Resolution with LED Backlight**
- **Touchscreen Interface and Software Controlled 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% minimum
- **Controller:** Built-In
- **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:** Socket with provision for SD, MMC, or SDHC Flash Disk Cards

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-212 Assembly with 4.3” Touchscreen
- Molded plastic LCD mounting bracket and standoffs
- Four Serial Port cables
- Two Audio cables (included with purchase of the Audio Option)
- CDROM with manuals, schematics, and drivers

2 SOM-212 Product Details

2.1 Jumper Configuration & Connector Descriptions

The SOM-212 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: refer to the SoM (Module) User Manual for further information on proper Jumper placement.

Table 1: Jumpers

Label	Function	Default
JB1	Boot0 Source Selection	Position B
JB2	Boot1 Source Selection	Position A
JB3	Flash Write Protect	Position NP

Table 2: Connectors

Label	Function
JK1	5v Power Barrel Jack
JK2	USB C OTG
JK3	Ethernet
HDR1	I/O Interface
HDR2	COM C Serial Port
HDR3	COM B Serial Port
HDR4	COM A Serial Port
HDR5	COM D Serial Port
HDR6	USB Host A & B
SOK1	200 pin SOM Socket
SOK2	MicroSD Card Socket
CN1	Alternate Power Input
CN2	CAN Interface Connector
CN3	LCD Interface Connector
CN4	Audio Line Input Jack
CN5	Audio Line Output Jack

2.2 Power Connectors

The SoM-212 provides two power connectors. CN1 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. JK1 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 5V DC wall mount power supply (EMAC part number PER-PWR-00032). The SoM-212's power input uses a switching regulator and allows a voltage input of +5V DC to 36V DC only if you are using the CN1 power connector.

- To power the SoM-212 from 5V DC use either the JK1 or Pin #1 on CN1.
- To power the SoM-212 from 8V to 36V DC use Pin #4 on CN1.
- Alternatively the SoM-212 can be power from a Power Over Ethernet (POE) Switch provided the SoM-212 POE option is installed.

The pinout for the CN1 power connector is as follows:

Pin	Signal
1	+5V DC
2	GND
3	GND
4	+Vin (+8V to 36V DC)

Note: Do not drive both the +5V and the +Vin power inputs. Drive one or the other.

2.3 Ethernet

The SOM-212 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. POE is optionally available.

2.4 Serial Ports

The SOM-212 is equipped with Four serial ports, all of which terminate to 10-pin header connectors (see table 2, 3, 4 & 5 below). Four 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. This port is usually the default Console port.

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	COMC_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	-

Table 5 (COM D 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	-

2.5 USB Host Ports

The SOM-212 provides two, USB 2.0 Host ports. 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.

In addition to the one USB Host port, the SoM-250 provides a USB On-The-Go (OTG) port (JK2). This port can be used as either a USB Host or USB Device port.

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.

2.6 Audio Port Option

The SOM-212 provides Audio Line Out and Line In capability through a two 4-pin 1.25mm headers (CN4 & CN5). A special cable (included with the Audio Option) converts the signals present on the header to two standard 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-212 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 a constant current source of 20mA which results in a voltage of approximately 30 volts. The processor provides a PWM (SoM Pin #85) 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 setting SoM Pin #114 low. 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-212 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-212, can be read by another computer using a MicroSD card reader. The MicroSD interface is compatible with Standard and High Capacity MicroSD cards.

2.9 Keyboard/Mouse

The SOM-212 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 HDR1 (see Table 6 below) and are labeled as analog_04, analog_05, analog_06 and analog_07. These may or may not be supported by the SoM (Module) plugged into this carrier. Please refer to the SoM Module User Manual for further details.

2.11 I/O Expansion

The Processor used by the SOM-212 provides a number of unused I/O lines. The SOM-212 provides access to these lines on connector HDR1. This 20-pin dual row header contains GPIO lines, SPI bus, I^2C 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.

Table 6

Pin	**Signal**	**Pin**	**Signal**
1	GND	2	3.3V
3	I2DAT	4	I2CLK
5	~RESET_OUT	6	SPI_MISO
7	SPI_CLK	8	SPI_MOSI
9	SPI_CS1	10	SPI_CS0
11	SPI_CS3	12	GPIO07
13	ANALG_05	14	GPIO13
15	ANALG_06	16	IRQA
17	ANALG_04	18	GPIO15
19	ANALG_07	20	GPIO12

2.12 Real-Time Clock

The SOM-212 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-212 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-212 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 (JK3)

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 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

4.3 USB OTG Host/Device connector (JK2)

Pin	Signal
1	USB_OTG_VBUS
2	USB_OTG_C-
3	USB_OTG_C+
4	USB_OTG_ID
5	GND

4.4 Power Connector (CN1)

Pin	Signal
1	5V DC
2	GND
3	GND
4	+Vin (+8V to +36V)

4.5 CAN Interface (CN2)

Pin	Signal
1	CAN+
2	CAN-
3	GND

4.6 LCD/Touch/Backlight (CN3)

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

4.7 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

4.8 COMA RS-232 Serial Port (HDR4)

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 (HDR3)

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 (HDR2)

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 COMD RS-232 Serial Port (HDR5)

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	-

4.12 Misc. I/O (HDR1)

Pin	Signal	Pin	Signal
1	GND	2	3.3V
3	I2DAT	4	I2CLK
5	RESET_OUT	6	SPI_MISO
7	SPI_CLK	8	SPI_MOSI
9	SPI_CS1	10	SPI_CS0
11	SPI_CS3	12	GPIO07
13	ANALG_05	14	GPIO13
15	ANALG_06	16	IRQA
17	ANALG_04	18	GPIO15
19	ANALG_07	20	GPIO12

5 Appendix B: *Jumper Settings*

(See SoM Module manual for correct Boot jumper settings)

JB1 Boot0 Source Selection

Jumper	**Position**	**Setting**
Pins 2 & 3	A	Line pulled LOW
Pins 1 & 2*	B	Line pulled HIGH

* Default setting

JB2 Boot1 Option Selection

Jumper	**Position**	**Setting**
Pins 2 & 3*	A	Line pulled LOW
Pins 1 & 2	B	Line pulled HIGH

* Default Setting

JB3 Flash Write Protect

Jumper	**Position**	**Setting**
Pins 1 & 2	A	Flash Write Disable
Pins 2 & 3*	B	Flash Write Enable

* Default Setting

6 Appendix C: *Mechanical drawing with dimensions*