SoM-536EM

User Manual

REV. 1.0

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2. Introduction

This document describes EMAC's SoM-536EM (SBC) module. The SoM-536EM is a System on Module, designed to be compatible with EMAC's 144-pin SODIMM form factor standard. This module is built around the Analog Devices ADSP-BF536 microcontroller, which provides several of its key features.

The SoM-536EM has an on-board Ethernet PHY, 2 serial ports, CAN, an RTC, NOR flash, Serial EEPROM, and SDRAM.

In addition to these standard SoM features, the SoM-536EM also features a fast 16-bit DSP core, open source software support, and a wide range of controller I/O pins.

2.1 Features

- **Small, 144 pin SODIMM form factor (2.66" x 1.5")**
- **Analog Devices Blackfin ADSP-BF536 400/600 MHz Processor**
- **10/100 BaseT Ethernet with on-board PHY**
- **2 Serial ports, one with full handshake and one with CTS/RTS handshake**
- **Up to 64 MB of SDRAM**
- **Up to 4 MB of Resident NOR Flash**
- **128K Bytes of Serial Flash**
- **Battery backed Real Time Clock**
- **SPI port with MMC/SD Flash Card Interface**
- **I2S Audio port**
- **I2C port**
- **CAN port**
- **Timer/Counters and Pulse Width Modulation (PWM) ports**
- **1-Wire port**
- **Typical power requirement less than 1 Watt**
- **JTAG for debug, including real-time trace**
- **FREE Eclipse IDE with GCC and GDB development tools**

3. **Hardware**

3.1 Standard Specifications

- **CPU:** Embedded Analog Devices Blackfin ADSP-BF536 processor running at 400 MHz.
- **Flash:** 4 MB External NOR Flash and 128K of utility serial Flash.
- **RAM:** 16 MB 100 MHz SDRAM.
- **Flash Disk:** SPI serial SD/MMC interface.
- **System Reset:** Supervisor with external Reset Button provision.
- **RTC:** Internal Real Time Clock/Calendar with battery-backed provision.
- **Timer/Counters:** 8, 32-bit timers/counters with capture, compare, and PWM.
- **Watchdog Timer:** Programmable System Reset
- **Digital I/O:** 24 General Purpose I/Os
- **Power:** Power Management Controller allows selectively shutting down on processor I/O functionality and entering and exiting sleep modes.
- **JTAG**: JTAG for debug, including real-time trace
- **CLOCKS**: PLL synthesized 8MHz, 200KHz, 14.3MHz clock outputs

Serial Interfaces

- **UARTS:** 2 serial TTL level serial ports with handshaking. One Serial Port is multiplexed providing a pseudo 3rd port. (each UART requires external RS level shifting).
- **SPI:** High-Speed SPI port with 3 chip selects.
- **Audio:** I2S Synchronous Serial Controller with analog interface support (requires external CODEC)
- **CAN:** Full CAN 2.0B controller (requires external CAN transceiver)

Ethernet Interface

- **MAC:** ADSP-BF536 on chip MAC
- **PHY:** Intel/Cortina LXT927ALC with software PHY shutdown control
- **Interface:** IEEE 802.3u 10/100 Base-T Fast Ethernet (requires external magnetics and RJ45 Jack)

Bus Interface

- Local ADSP-BF536 Bus accessible through SODIMM provides 9 address lines, 16 data bus lines, and control lines.

Mechanical and Environmental

- **Dimensions:** SODIMM form factor with the length dimension extended (2.66" x 1.5")
- **Power Supply Voltage:** +3.3 Volts DC +/- 5%
- **Power Requirements:**
  - Typical 3.3 Volts @ 330 mA. (≈1 watt)
  - Max current draw during boot process: 380 mA.
  - Constant busy loop: 350 mA.
  - Idle system: 300 mA.
  - Idle system with Ethernet PHY disabled: 200 mA.

- **Operating Temperature:** -0 ~ 70° C (32 ~ 158° F), fan-less operation
- **Operating Humidity:** 0%~90% relative humidity, non-condensing

3.2 Real Time Clock

The SoM-536EM uses the ADSP-BF536's on chip real time clock. Battery backup is provided from the carrier board using the VSTBY pin. The RTC has the provision to set Alarms that can interrupt the processor. For example, the processor can be placed in Sleep mode and then later awakened via the Alarm function.

3.3 External Connections

The SoM-536EM connects to a carrier board containing its connectors, power supply and any expansion I/O through a standard gold-plated SODIMM 144 pin connection (edge connector shown below).

The SoM module will fit in any standard 144-pin SODIMM socket. These connections are designed to be compatible with all EMAC 144-pin SoM products. See EMAC SoM 144-pin SODIMM Pinout Specification to see how other 144-pin SoMs pinouts line up with the SoM-536EM's pinout.

The use of the SODIMM form-factor for EMAC's SoMs is a sound choice that has been proven rugged and reliable in the laptop and embedded SBC markets.

The remainder of this section describes the pinout as it applies specifically to the SoM-536EM processor.

3.3.1 External Bus

The SoM-536EM provides a flexible external bus for connecting peripherals. The CPLD of the SoM-100ES and SoM-150ES Carrier Boards connect through a subset of these connections. The Blackfin uses a difficult addressing scheme. EMAC has simplified this scheme through the use of a PLD on the SoM to manage external address lines and chip selects.

SODIMM Pin#	SoM Pin Name	Processor Pin Name(s)	Description
100	GP_CS1	PLD	General Purpose Processor Chip Select
98	GP_CS2	PLD	General Purpose Processor Chip Select
108	GP_CS3	PLD	General Purpose Processor Chip Select
16	~RD/~OE	ARE	Read Signal
83	~WR	AWE	Write Signal
6	~RST_IN	NC	Supervisor Reset In
43	~RST_OUT	NC	Supervisor Reset Out
44	~EA	NC	
85	~RD_ALT	AOE	Output Enable
72	ALE/~TS	NC	
26,35,33,31, 28,109,111, 113,10	A0-A8	PLD	Address Bus
29,27,25,22, 23,21,19,20, 8,24,34,70, 77,81,84,86	D0-D15	D0-D15	Data Bus

The SoM-536EM only provides 9 address lines and the SoM-144 pin specification allows for 22 address lines. Therefore EMAC utilized some of these lines to bring out other ADSP-BF536 I/O lines that otherwise would not have fit.

SODIMM Pin#	SoM Pin Name	Processor Pin Name(s)	Description
12,18,14,37,5	A9-A13	GND	Ground
11,9,7,13,97, 17,15,104	A14-A21	PG0-PG7 PPI0-PPI7	GP I/O PortG / PPI Port

3.3.2 Module specific interface

The SoM-536EM module specific interface brings out several module specific connections from the processor. The interface includes timers, SPI, and MMC/SD interfaces. If using the SPI for devices other than the MMC/SD, SPI lines should be accessed from the specific SPI signal group for these devices.

SODIMM Pin#	SoM Pin Name	Processor Pin Name(s)	Description
45	MS0	NC	Used for USB_Vbus on SoM-526
46	MS1	PF9/TMR0/FS1	GPIO / Timer
47	MS2	PF8/TMR1/FS2	GPIO / Timer
48	MS3	EMU	Emulation Debug line
49	MS4	NC	Used for USB_ID on SoM-526
50	MS5	SPI_MISO_E	SPI MISO
51	MS6	SPI_MOSI_E	SPI MOSI
54	MS7	SPI_SCLK_E	SPI Clock
55	MS8	PJ9/TSCLK0	GPIO / SPORT TX CLK
56	MS9	PF7/TMR2/FS3	GPIO / Timer
57	MS10	PF10/SPI_SSEL1	GPIO / SPI CS 1
60	MS11	NC	Device USB on SoM-526
61	MS12	NC	Device USB on SoM-526
64	MS13	NC	Host USB on SoM-526
65	MS14	NC	
66	MS15	NC	Host USB on SoM-526
67	MS16	NC	

3.3.3 JTAG

The SoM specifications allows for access to the JTAG lines for the ADSP-BF536 processor. These connections will allow the Flash to be programmed in circuit via a program running from the processor and also the capability to debug software.

SODIMM Pin#	SoM Pin Name	Processor Pin Name(s)	Description
139	JTAG_TCK	TCK	JTAG clock
137	JTAG_TDI	TDI	JTAG serial in
138	JTAG_TDO	TDO	JTAG serial out
140	JTAG_TMS	TMS	JTAG operation mode
112	ND	TRST	Test Reset Signal

3.3.4 One-Wire/I2C

The SoM specification calls for a one-wire port. Since the ADSP-BF536 processor does not have a one-wire port, an I2C one-wire chip (DS2482) was utilized to provide this functionality. The SoM specification allows for these lines to also be used for I2C access. However, since the SoM-536EM provides 1-Wire, the I2C lines are routed to the GPIO group.

SODIMM Pin#	SoM Pin Name	Processor Pin Name(s)	Description
116	LOCAL1W/SCL	DS2482	1-Wire I/O
88	SDA	NC	

3.3.5 Ethernet

The SoM-536EM provides a Cortina LXT972 Ethernet PHY IC on board. Carrier designers need only run these lines through the appropriate magnetics and RJ45 connector to have a functional Ethernet port. Remember the RX and TX lines are differential pairs and need to be routed as such.

The LED/configuration pins' state at reset determines the Ethernet's configuration (10-baseT, 100-base-T, auto-configuration) and the function of the LEDs. The SoM-100ES and the SoM-150ES pull them all high, which configures the chip for network auto-configuration, with LED1 functioning as active low link, and LED2 functioning as active low Rx status (Refer to Carrier schematics).

SODIMM Pin#	SoM Pin Name	LXT972 Pin Name	Description
89	LED_LINK/CFG_1	LED_LINK/CFG_1	Ethernet Link LED/Configuration pin
90	LED_RX/CFG_2	LED_RX/CFG_2	Ethernet Activity LED/Configuration pin
94	Ethernet_Rx-	Ethernet_Rx-	Low differential Ethernet receive line
92	Ethernet_Rx+	Ethernet_Rx+	High differential Ethernet receive line
93	Ethernet_Tx-	Ethernet_Tx-	Low differential Ethernet transmit line
91	Ethernet_Tx+	Ethernet_Tx+	High differential Ethernet transmit line

3.3.6 SPI

The ADSP-BF536 processor provides a SPI module for communicating with peripheral devices. The SPI bus is connected to both the SPI group and Module Specific group. The SPI access in the Module Specific group has been delineated for MMC/SD Flash Card access and has a unique SPI chip select. Linux users can use the open source driver provided by EMAC. Any other SPI device should be connected to the SPI signals within the SPI group. Three SPI chip selects are provided within this group.

SODIMM Pin#	SoM Pin Name	Processor Pin Name(s)	Description
122	SPI_MI	SPI_MISO_E	SPI0 serial data in
121	SPI_MO	SPI_MOSI_E	SPI0 serial data out
120	SPI__SCK	SPI_SCLK_E	SPI0 serial clock out
123	SPI_CS0	PJ11/SPI_SSEL2	SPI0 slave select line 2
124	SPI_CS1	PJ10/SPI_SSEL3	SPI0 slave select line 3
110	SPI_CS2	PF6/TMR3/SPI_SSEL4	SPI0 slave select line 4

3.3.7 MCI Multimedia/Secure Digital Card

The SoM-536EM provides a MMC/SD card interface using the SPI lines in the Module Specific group. The MMC/SD lines are shared with SPI lines, however they can be used in both functions because they have unique SPI chip selects.

The SoM-100ES Carrier board uses a serial SPI based MMC/SD interface. The SoM-150 Carrier generally uses a 4-bit parallel interface, however the ADSP-BF536 does not have this provision. Therefore the SoM-536EM utilizes SPI to access the SoM-150's MMC/SD socket in SPI mode. The drivers provided are written to utilize SPI interface and as such will operate with either the SoM-100ES or the SoM-150ES Carrier board.

SODIMM Pin#	SoM Pin Name	Processor Pin Name(s)	Description
54	MS7/SD Clock	SPI_SCLK_E	SPI clock out
51	MS6/SD CMD	SPI_MOSI_E	SPI0 serial data out
50	MS5/SD D0	SPI_MISO_E	SPI0 serial data in
55	MS8/SD D1	MCDA1/PA9	Not used for MMC/SD
56	MS9/SD D2	MCDA2/PA10	Not used for MMC/SD
57	MS10/SD D3	PF10/SPI_SSEL1	MMC/SD Chip Select

3.3.8 Serial Ports

The SoM-144 pin specification has the provision for 3 serial ports. However, the ADSP-BF536 only provides 2 serial ports. The SoM-536EM provides for all 3 serial ports by multiplexing SoM COMA and COMB (COMA is the default) to the same ADSP-BF536 UART #1. The multiplexer is controlled via the PLD. Typically, the SoM specification calls for COMA UART1 to be the host terminal port. The ADSP-BF536 does not provide any handshake lines; therefore EMAC has provided PLD-based handshake lines. For programming of these lines and the multiplex control see the section on PLD I/O.

SODIMM Pin#	SoM Pin Name	Processor Pin Name(s)	Description
71	COMA_RXD	UART1_RX_E1	COMA receive/GPIO
73	COMA_TXD	UART1_TX_E1	COMA transmit/GPIO
38	COMB_RXD	PF3/UART1_RX_E0/TMR6	Alt. COMA receive/GPIO
36	COMB_TXD	PF2/UART1_TX_E0/TMR7	Alt. COMA transmit/GPIO
82	COMB_RTS/GPIO	PLD	COMA RTS/GPIO
78	COMB_CTS/GPIO	PLD	COMA CTS/GPIO
103	COMC_RXD_	PF1/UART0_RX	COM0 receive/GPIO
102	COMC_TXD	PF0/UART0_TX	COM0 transmit/GPIO
107	COMC_DSR/GPIO	PLD	COM0 DSR /GPIO
106	COMC_DTR/GPIO	PLD	COM0 DTR/GPIO
76	COMC_RI/GPIO	PLD	COM0 RING/GPIO
30	COMC_DCD/GPIO	PLD	COM0 DCD/GPIO
39	COMC_RTS/GPIO	PLD	COM0 RTS/GPIO
79	COMC_CTS/GPIO	PLD	COM0 CTS/GPIO

3.3.9 GPIO

This group provides for the SoM general purpose I/O section. Almost all of these pins can be configured to be general-purpose digital ports as well as IRQ inputs. They can also be configured to take advantage of several of the functions of the ADSP-BF536's internal silicon such as Timer/Counters and I2C lines.

Timer/Counters:
The general-purpose timer module on the ADSP-BF536 is comprised of eight 32-bit timers/counters with independently programmable input-capture or output compare lines. These can be used for a wide variety of timed applications, including counters and PWM. While the majority of the timers are found in the GPIO group on the SoM-536EM, they also can be found in other groups that share the physical pin such as UART1.

For more information on the Timer functions of the ADSP-BF536 processor, users are referred to the General-Purpose Timers section of the ADSP-BF536 *Hardware Reference Manual*.

SODIMM Pin#	SoM Pin Name	Processor Pin Name(s)	Description
75	IRQA/GPIO	PF15/PPICLK	GPIO / Timer & PPI Clock
32	IRQB/GPIO	PG8/PPI8	GPIO
40	IRQC/GPIO0	PG9/PPI9	GPIO
42	IRQD/GPIO1	PG10/RSCLK1	GPIO / SPORT RX Clock1
87	GPIO2	PF5/PG13/TMR4/TSCLK1	GPIO / Timer4 / SPORT TX Clock
80	GPIO3	PJ2/SCL	I2C Clock
125	GPIO4	PJ3/SDA	I2C Data
126	GPIO5	PG12/DR1PRI	GPIO / SPORT RX1 Primary
127	GPIO6	PG11/RFS1	GPIO / SPORT Receive Frame Sync1
128	GPIO7	PG14/TFS1	GPIO / SPORT Transmit Frame Sync1
129	GPIO8	PF6/TMR3/SPI_SSEL4	GPIO / Timer / SPI CS
130	GPIO9	PF4/TMR5	GPIO / Timer
131	GPIO10	PJ6/RSCLK0	GPIO / SPORT RX Clock0
132	GPIO11	PJ7/RFS0	GPIO / SPORT Receive Frame Sync0
133	GPIO12	PJ8/DR0PRI	GPIO / SPORT RX0 Primary
134	GPIO13	PLD	GPIO
135	GPIO14	PLD	GPIO
136	GPIO15	PLD	GPIO
105	~LDAC/~GPIO	PG15/DT1PRI	GPIO / SPORT TX1 Primary
114	8MHz	Prescaler 25MHz/3	OSC Out ~8.33 MHz
115	200KHz	PLD 25MHz/128	OSC Out ~195.3 KHz
117	14.3MHz	Prescaler 25MHz/2	OSC Out ~12.5 MHz

3.3.10 Power Connections

The SoM-536EM requires a 3.3V supply for Bus and I/O voltages. The 1.8V processor core voltage is regulated on module from the 3.3V supply. 5Vdc on the ALT_VCC pin is required for 1-Wire and serial multiplexer operation but can be connected to 3.3Vdc if 5Vdc is not available.

SODIMM Pin#	SoM Pin Name	Processor Pin Name(s)	Description
3,4,141,142	3.3VCC	3.3VCC	3.3 Volt voltage core to the processor
1,2,52,53,58, 59,62,63,68, 69,143, 144	GND	GND	Ground
119	VSTBY	VDDBU battery backup	Voltage standby, this is the backup voltage provided to the internal RTC of the processor. If RTC readings are not important for the application, this can be attached to the 3.3V rail.
118	ALT_VCC	NA	1-Wire pullup voltage & Mux power typically 5Vdc but can run at 3.3Vdc.
101	AV_VCC	NC	Analog power. Not required for the SoM-536EM.
99	V_REF	NC	No external Analog Reference voltage is required.

3.3.11 Boot Options

The SoM specification provides two pins for boot time configuration. On the SoM-536EM, only one connection is required so the other pin is connected to the PLD for general access. The Boot Mode Select (BMODE_CONTROL) pin allows the SoM-536EM's RAM to be loaded serially or the ADSP-BF536 processor to be booted from external NOR flash. If BOOT_OPTION1 is grounded, the processor will boot from external NOR flash. Otherwise, the processor will attempt to boot from a UART host.

SODIMM Pin#	SoM Pin Name	Processor Pin Name(s)	Description
41	BOOT_OPTION1	BMODE_CONTROL	Boot Mode Select
74	BOOT_OPTION2	PLD	GPIO

3.4 CPLD

A CPLD is located in the memory map within the physical address range of 0x203C0000 to 0x203FFFFF. Though the SoM-536EM ships with the CPLD preprogrammed with a standard core, it is possible to reprogram a new IP core for special applications. See the Custom Cores section for more information.

3.4.1 SoM-536EM B0 Core

The standard SoM-536EM B0 core contains circuitry to combine the chip selects of the ADSP-BF536 processor's static memory controller to enable the addressing of larger NOR flashes. The PLD also provides serial handshaking lines, clock dividers, an Ethernet power down pin, status inputs and the serial multiplexer switch pin. Address range 0x203C0000 to 0x203CFFFF is reserved for the core SoM functionality and the remainder of the address space is divided between three general-purpose chip selects.

ADDRESS	REGISTER NAME	TYPE
0x203C0000	control[7:0]	gpo
0x203C001A	status	gpi
0x203C001C	control[15:8]	gpo
0x203C001E	core_id	gpi

The register types are as follow:

REGISTER TYPE	DESCRIPTION
Gpi	Input port. This is a read-only register.
Gpo	Output port. This is a write-only register*.

*Reading this type of register produces undefined results.

ADDRESS Range	Chip Select
0x203D0000-0x203DFFFF	GP_CS1
0x203E0000-0x203EFFFF	GP_CS2
0x203F0000-0x203FFFFF	GP_CS3

3.4.2 Status

This is a read-only register that returns various status bits.

7	6	5	4	3	2	1	0
-	-	-	COMC_RI	COMC_DSR	COMC_CTS	COMB_CTS	BOOT2

3.4.3 Control

This is a write-only register that allows the manipulation of several output bits.

7	6	5	4	3	2	1	0	
-	-	-	SERIAL_SW	COMC_DTR	COMC_DCD	COMC_RTS	COMB_RTS	
0	0	0	0	0	0	0	0	RESET

15	14	13	12	11	10	9	8	
-	-	-	-	ETH_PWR_DOWN	GPO	GPO	GPO	
0	0	0	0	0	0	0	0	RESET

3.4.4 core_id

This read-only register returns the identification byte for the core. This is used to determine the type of core programmed into the CPLD. Returns 0xB0 for the B0 core.

3.4.5 Linux drivers

The SoM-536EM machine specific code of the EMAC patched Linux kernel creates a virtual mapping, reads the core_id register and classifies any devices created by the CPLD in the sysfs filesystem, providing user space access. Kernel patches are currently available through EMAC.

3.4.6 Custom Cores

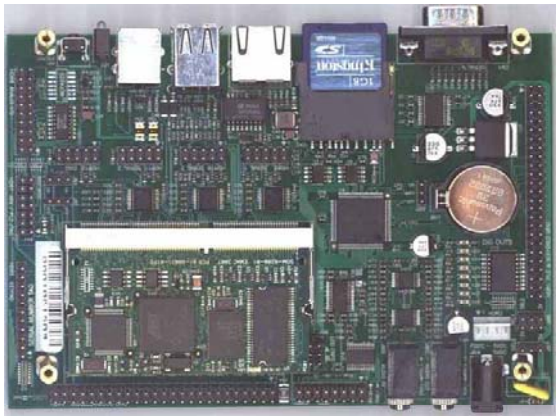
While there is provision to reprogram the CPLD in-circuit, doing so will void your warranty. It is not a recommended practice because incorrect logic can damage the SoM-536EM. Please contact EMAC for contract engineering and consulting services to design a custom or semi-custom CPLD core.

If you choose to void your warranty, Altera offers powerful free tools for programming the Max II plus. These tools include free and flexible modules for implementing UARTs, I2C, Counters, RAM, etc.

https://www.altera.com/support/software/download/altera_design/quartus_we/dnl-quartus_we.jsp

4. Design Considerations

One of the goals of the SoM-536EM is to provide a modular, flexible and inexpensive solution capable of delivering high-end microcontroller performance.



4.1 The EMAC SoM Carrier SoM-150ES

EMAC provides an off the shelf carrier for the SoM-536EM module, the SoM-150ES, which provides power to SoM modules and provides them with an extended range of I/O. This board can be used in conjunction with the SoM-536EM, however the SoM-536EM does not provide USB so the USB provision on the carrier will be inoperable. This board comes with full schematics and BOM, and can be used as is, or as a reference for a customer's own design.

http://www.emacinc.com/som/som150es.htm

EMAC also offers a semi-custom engineering service. By modifying an existing design, EMAC can offer quick-turn, low-cost engineering, for your specific application.

4.2 The EMAC SoM Carrier SoM-100ES

EMAC provides an off the shelf carrier for its SoM modules, the SoM-100ES, which provides power to SoM modules and provides them with an extended range of I/O.

http://www.emacinc.com/som/som100es.htm

4.3 Power

The SoM-536EM requires a voltage of 3.3V and 330mA. For a bare-bones population, users can get away with using only 3.3V, and simply provide this to all the voltage inputs listed in 2.3.10. This however, will not provide battery backup for the RTC. Additionally, 5V is required if 5V 1-Wire is being used.

4.3.1 ALT_VCC

ALT_VCC is a required connection in order to utilize the 1-Wire port and UART1 of the processor. This pin is typically connected to 5Vdc but can alternatively operate at 3.3Vdc.

4.3.2 Analog Reference

No external Analog Reference voltage is required for the SoM-536EM.

4.3.3 Shutdown Logic Pins

The SHDN and WKUP pins on the SoM-536EM are not utilized, no connection is required.

4.3.4 Battery Backup

The SoM-536EM contains 3 potentially non-volatile memory areas, the NOR flash, the real time clock, and the serial flash of the module. The flash is always non-volatile, while the real time clock requires a backup voltage to maintain its data. This backup voltage comes from the VSTBY pin, and should be connected to 3.3 volts.

The RTC will draw up to 30 uA maximum (15 uA typical). If the RTC is not needed, this can just be tied to the 3.3V supply rather than a standby battery.

The SoM-100ES and SoM-150ES provide battery backup voltage through a socket-able BR2032, which is a standard 3V 190mA·H 20MM coin battery that can be picked up from most electronics stores. With the power consumption of the RTC on the SoM-536EM, this battery will have a typical life of approximately 1.5 years. A larger battery may need to be selected for designs requiring longer battery life. Note: Battery power is only used when the module is unpowered.

4.3.5 Analog Voltage

The SoM-536EM requires no analog supply voltage since this module does not incorporate any analog circuitry such as and A/D or D/A.

4.3.6 Output Drive Capabilities

The many I/O lines on the SoM-536EM have different drive capabilities depending on the type of driver associated with each connection on the processor. Port F lines 0-7 have high-current drive and sink capabilities with a total of 64 mA on all eight lines combined. Drive and sink current capabilities for other I/O depends on which lines are used as well as the amount of current driven on the combination of lines. See the *ADSP-BF534/ADSP-BF536/ADSP-BF537 Processor Data Sheet* for technical information regarding the current drive and sink capabilities of the processor.

5. Software

The SoM-536EM offers a wide variety of software support from both open source and proprietary sources. The hardware core was designed to be software compatible with the Analog Devices ADSP-BF536-EK reference design, which is supported by uClinux.

5.1 Eclipse

EMAC provides sample code for the SoM-536EM as CDT projects within the free Eclipse IDE. Eclipse is a powerful open-source Java based IDE. It has plug-ins for development and debugging in Java and C, as well as several other languages.

http://www.eclipse.org/

EMAC offers a free download of Eclipse pre-integrated with the CDT plug-in and plug-ins for remote debugging and SVN. Eclipse requires the Java Runtime Environment to be installed on the development system. Currently EMAC only supports the use of Eclipse under the Linux environment for the SoM-536EM. The Eclipse environment and JRE for Linux are available online along with user manuals.

ftp://ftp.emacinc.com/PCSBC/Development_Kits/EMAC_Open_Tools/

5.1.1 Eclipse CDT plug-in

The Eclipse CDT plug-in provides a powerful graphical IDE for C development. This plug-in relies on GNU Make to build its files, so its projects are highly portable to other IDE's (or lack of them completely). It also offers a MI based debugger, for plugging into newer GDBs.

http://www.eclipse.org/cdt/

5.2 Das U-Boot

The SoM-536EM is distributed with Das U-Boot installed. U-Boot is an open source, cross-architecture, platform independent bootloader. It supports reading and writing to the flash, auto-booting, environmental variables, and TFTP. Das U-boot can be used to upload and run and/or reflash the OS on the SoM-536EM without the use of a JTAG cable, or to run stand-alone programs without an OS. SoM-536EM modules are shipped with a valid MAC address installed in flash in the protected ethaddr environmental variable of U-Boot. At boot time U-Boot automatically stores this address in a register within the MAC, which effectively provides it to any OS loaded after that point.

5.3 µClinux

µClinux is an open source Linux distribution for use with small resource systems such as the Blackfin processor. It's a full distribution built on the Linux kernel, which fully supports the embedded Blackfin architecture.

The SoM-536EM build uses a Linux kernel that has been has been patched to support the SoM-536EM and SoM-150ES devices.

EMAC's uClinux distribution contains everything a user could expect from a standard Linux kernel, including powerful networking features, advanced file system support, security, debugging utilities, and countless other features.

The SoM-536EM will work out of the box with EMAC's Embedded uCLinux distribution, and EMAC provides the most up to date distribution via FTP. The SoM-536EM comes preinstalled with a 2.6 or later Linux kernel integrated with the latest version of EMAC's uClinux distribution.

http://www.uclinux.org

5.3.1 Linux with Xenomai Real Time Extensions

Xenomai provides real time extensions to the kernel and can be used to schedule tasks with hard deadlines and μs latencies. The Xenomai build is an additional module that can be added to the standard Linux kernel and is available for a one-time inexpensive support and installation fee.

http://www.xenomai.org/

5.3.2 Linux Modules

EMAC provides support for many Linux modules, Xenomai Real Time Extensions being one of them. As with the Xenomai module, other modules can be added to the standard Linux filesystem and are available for a one-time inexpensive support and installation fee. Contact EMAC to request a particular module.

5.3.3 Linux Patches

In addition to standard Embedded Linux support, EMAC has released a number of patches and device drivers from the open source community and from internal EMAC engineering into its standard distribution. Currently, the kernel patches and some useful scripts may be downloaded from EMAC's ftp site at:

ftp://ftp.emacinc.com/Controllers/SoM/SoM-536EM/Software/Linux-Kernel/

Along with kernel patches, EMAC provides the binaries for the kernel and root file system.

Blackfin Cross Compiler

The popular open source GCC compiler has a stable build for the Blackfin family. The Embedded Linux kernel and EMAC Eclipse CDT projects use this compiler for building Blackfin stand-alone and OS specific binaries. The EMAC Eclipse SDK provides source level debugging over either the JTAG port or over Ethernet or serial using gdbserver. The Linux binaries for the Blackfin cross compiler are available online along with the SDK for the SoM-536EM at the following location.

ftp://ftp.emacinc.com/Controllers/SoM/SoM-536EM/Tools/

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

