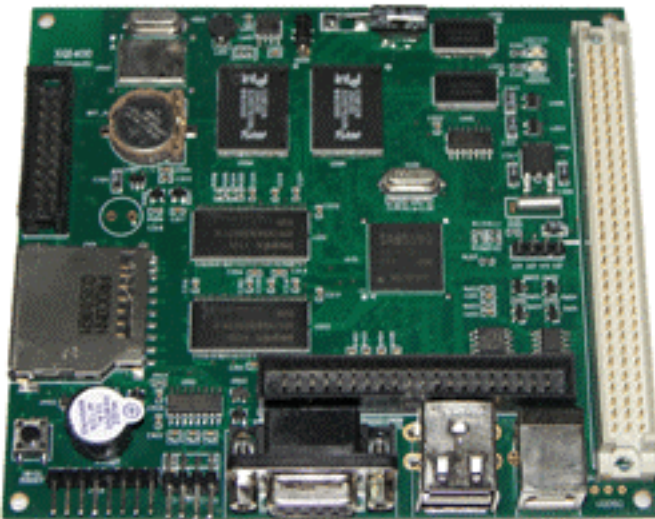


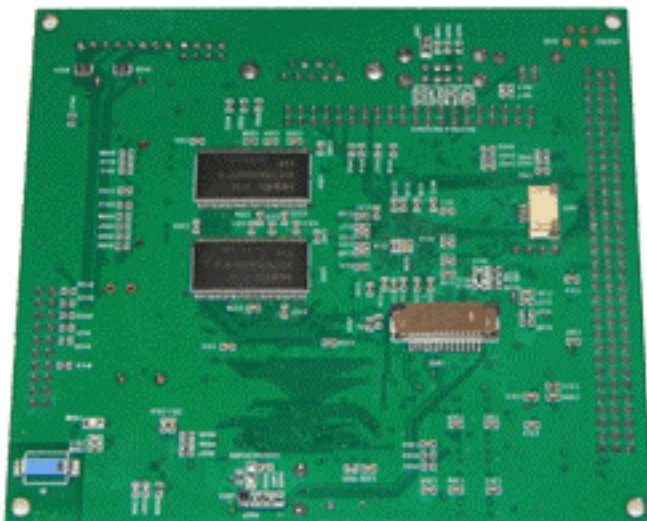
SBC2410 Single Board Computer

- ARM920T Single-board Computer based upon Samsung S3C2410
- RS232, USB host, USB device LCD, TSP, Keypad, SD card, Bluetooth
- Full Bus and Peripheral Signal Expansion
- Capable of supporting Linux, WinCE or any embedded operating system

The SBC2410 is a full-featured single board computer (SBC) using the Samsung S3C2410 processor, which is based upon the ARM920T architecture. This 16/32 bit RISC architecture can operate at 200MHz and contains a memory management unit making it a suitable platform for stand alone applications, embedded real time operating systems and complex operating systems such as Linux or WinCE.



The SBC2410 takes advantage of the ARM9, supporting a variety of onboard peripherals such as a serial Flash, 64Mbyte Nor Flash, 128Mbyte SDRAM, 2-channel USB Host and 1-channel USB Device, buzzer, battery backed RTC, and reset button. In addition to this, expansion connections are made available via a number of header connectors and support peripheral LCD hardware, touch screen, matrix keypad, SD card and the full processor interface including JTAG.



Source code is provided with the SBC2410 providing the designer with the ability to both understand hardware operation and also to quickly develop applications. Source code, provided with this platform, can be compiled then easily downloaded onto the SBC2410 via the JTAG interface.

Embest offers, as an option, a full-featured Integrated Development Environment (IDE) that can be used to develop applications, download binaries to the target and debug applications. The IDE runs from a PC and can be ordered with either a high-speed JTAG interface (up to 800kbps) or standard interface (120kbps).

Optional LCD display hardware is also available for this development board and can be easily connected to an existing header. Sample test software is provided for this interface.

Application Development

The SCB2410 is an ideal platform on which to develop application code for an ARM9 processor target. The Embest Integrated Development Environment is an inexpensive, full-featured development tool that runs under Windows, providing an excellent software development capability for any sized application. After building your image, you can use one of Embest's JTAG *In Circuit Emulation* tools and *Flash Programmer* to download the image onto the SBC2410.

Optional Development Tools

- *Integrated Development Environment*: The IDE includes editor, GNU ARM compiler, debugger, project manager, Flash Programmer, simulator and JTAG emulator. It supports all ARM7 and ARM9 processor families, runs under Windows and supports both ANSI C and ARM assembly language.
- *Flash Programmer*: A powerful tool for programming on-chip or external flash memory. It supports all targets based on ARM7 and ARM9 core processors and virtually all manufacture's flash chips.
- *ARM Emulator*: A standard parallel port JTAG Emulator for the ARM processor.
- *PowerICE*: An enhanced parallel port JTAG Emulator that operates at 120Kbs.
- *UnetICE*: This ICE connects to your USB or Ethernet port to the ARM JTAG interface, allowing both flash programming and debugging up to 800kbps.

Hardware Description

The S3C2410A processor consists of 16-/32-bit RISC (ARM920T) CPU core, separate 16KB instruction and 16KB data cache, MMU to handle virtual memory management, LCD controller (STN & TFT), NAND flash boot loader, System Manager (chip select logic and SDRAM controller), 3-ch UART, 4-ch DMA, 4-ch Timers with PWM, I/O ports, RTC, 8-ch 10-bit ADC and touch screen interface, IIC-BUS interface, IIS-BUS interface, USB host, USB device, SD host & multimedia card interface, 2-ch SPI and PLL for clock generation.

The SBC2410 exposes many of these features to the user in support of developing specific solutions. This board is characterized as follows:

- Dimensions: 120x107mm
- Working temperature: -20~70 Celsius
- Power supply: +5V
- Samsung S3C2410 (ARM920T core with MMU capable of 200⁺ MHz operation)
- LCD Display interface (STN or TFT)

- Touch-screen interface
- 4x4 Matrix Keypad interface
- SD card interface and holder
- Bluetooth port (UART0)
- RS232 port (can support GPS, UART1)
- RS232 port for PC communications (UART2)
- 2-channel USB HOST and 1-channel USB DEVICE
- 8Mbit (1M x 8) Serial Flash
- 256k Serial EEPROM (I2C)
- RTC (battery backed)
- 32Mbyte Nor Flash (64M optional)
- 64Mbyte SDRAM (128M optional)
- Buzzer
- JTAG debug port
- Reset button
- Status LEDs
- 96 pin expansion connector

Software

Included with this development board are software modules written in C that can be compiled using our Integrated Development Environment or any compiler capable of creating ARM binaries. Executable binaries can then be loaded onto the hardware via the JTAG interface and executed. Application programs can just as easily be developed and loaded onto the target for debugging.

Source code provided includes the following test modules:

- common (includes initialization code)
- color_lcd_test (STN 256 color LCD display test)
- led_test (LED test)
- eeprom_test (Serial EEPROM AT24C256 test)
- keybd_test (4x4 Keyboard test)
- buz_test (Buzzer test)
- sdi_test (SD Card interface test)
- rtc_test (Real time clock test)
- serial_flash_test (Serial Flash M25P80 test)
- tsp_test (Touch Screen test)
- uart_test (Serial port test)
- usb_test (USB Device test)
- all_test (Comprehensive board test)

Header Interfaces

There are a number of header connectors that are provided to the designer allowing them to access important areas of the processor I/O. Each header and its associated function is identified in Table 1.

Connector	Interface	Connector	Interface
J301	EX_PORT (96PIN)	J601	LCD
J401	SD CARD	J602	LCD
J402	JTAG	J603	TSP
J403	KEYBOARD	J604	TSP
J501	GPS	J605	USB Device
J502	UART2	J606A/B	USB Host
J503	UART2		

Table 1 Available I/O Provided by Header Connectors

LCD Interface (J601 / J602)

Two LCD specific connectors provide an interface for an LCD display. Two different displays are made available from Embest as an option and can interface directly into the headers provided. Table 2 provides the pin assignments for the 2x20 pitched header connector J601. This connector supports a 640 x 480 V16C6448AC TFT-type LCD. This optional LCD display comes with its own specially designed PCB that supplies backlight power and signal switch capability.

Signal	Pin number	Pin number	Signal
V _{DD} 50	1	2	NRESET
GPB5 (D.OFF)	3	4	LEND
VFRAME	5	6	VLINE
LCDVF0	7	8	VD2
LCDVF2	9	10	VCLK
VM	11	12	VD0
LCDVF1	13	14	VD3
VD4	15	16	VD7
VD9	17	18	VD11
VD23	19	20	VD18
VD1	21	22	GND
V _{DD} 33	23	24	LCDPWREN
GND	25	26	VD5
VD6	27	28	VD8
VD10	29	30	VD12
VD14	31	32	VD13
VD16	33	34	VD15
VD19	35	36	VD17
VD21	37	38	VD20
VD22	39	40	V _{DD} 33

Table 2 Pinout for J601 Header

The *Microtips MTGF32240HFWHSEB STN-type LCD* module can connect directly to J602 which is a right angled 14 pin 1mm pitched connector. The pin assignments are shown in Table 3.

Pin number	Signal	Description
1	CL2	Clock pulse for segment shift register
2	CL1	Common driver data shift signal
3	FRM	Frame start signal
4	NC	No connection
5	D3	Data input signal
6	D2	Data input signal
7	D1	Data input signal
8	D0	Data input signal
9	V _{EE}	LCD driver supply (V _{EE} +21.6V)
10	+3.3V	Logic supply voltage
11	GND	LCD driver supply (V _{SS})
12	EL	Enable pin for backlight (connected to S3C2410, pin GPG11)
13	GND	Power supply for EL driver (GND)
14	+5v	Power supply for EL driver (V _{DD})

Table 3 Pinout for J602 Header

Touch Screen Interface (J603 / J604)

J603 and J604 provide a an interface for external touch screen hardware. J603 is a right angle receptacle accepting a 4-connector 1mm pitched flat cable. The other, J604 is a 1x4 0.100” pitched straight header connector. The pin-out description for each header is provided in Table 4.

J602 header		J604 header	
Pin number	Signal	Pin number	Signal
1	YP	1	YP
2	XP	2	YM
3	YM	3	XP
4	XM	4	XM

Table 4 Pinout for J602 and J604 Headers

Matrix Keypad Interface (J403)

To support a 4x4-matrix keypad, there is a 1x8 0.100” pitched right-angle header connector (J403). The pin-out assignments are provided in Table 5.

Pin number	Signal
1	GPF0
2	GPF1

3	GPF2
4	GPF3
5	GPF4
6	GPF5
7	GPF6
8	GPF7

Table 5 Pinout for the J403 Header

SD Card Interface (J401)

Connector J401 accepts a SD card, its pinout values are provided for in Table 6.

Pin number	Signal	Description
1	SDD3	CD/DAT3
2	SDCMD	CMD
3	GND	GND
4	VDD33	VDD
5	SDCLK	CLK
6	GND	GND
7	SDD0	DAT0
8	SDD1	DAT1
9	SDD2	DAT2
10	WP	DAT3
11	nCD	nCD
PAD1	GND	GND
PAD2	GND	GND
PAD3	GND	GND
PAD4	GND	GND

Table 6 Pinout for J401 Header

Bluetooth Communication Port (integrated on-board)

The SBC2410 has an on-board Bluetooth communications transceiver, complete with antenna. The National Semiconductor LMX9820A is a Bluetooth Serial Port module that connects to an available UART port. The antenna resides on the bottom of the board. Table 7 provides signal definitions of the interface used in communicating with the Bluetooth module.

Device Pin	Signal	Description
C8	RXD0	UART_RX
D9	TXD0	UART_TX
D10	CTS0	UART_CTS
C10	RTS0	UART_RTS
D11 / G8	GPG9	Reset
E9	10k pull-up	Env0
B11	10k pull-up	Env1

J13	10k pull-down	ISEL1
H13	10k pull-up	ISEL2
H8	Antenna	RF in/out
B9 / B8	12MHz crystal	Clock
H2	+3.3V	VCC
H12	+3.3V	IOVCC
RF_GND	GND	GND
DIG_GND	GND	GND
USB_GND	GND	GND

Table 7 Bluetooth Wireless Connection Definition

RS232 Communications Port (J7)

An RS232 interface is provided via J7. UART signals are routed through an RS232 transceiver and are the provided on this header. It can be used as an interface to many peripheral devices and has been used to connect to a GPS module. J7 is a 1x4 0.100” pitched right angle header connector.

Pin number	Signal
1	GND
2	TX
3	RX
4	PWR

Table 8 Pinout for the J7 Header Supporting RS232

PC Communication Port (J502 / J503)

A second UART port is routed through an RS232 transceiver and brought to a female DB9 connector (J502) and a 1x4 0.100” pitched straight header connector (J503). The pin-out assignments are provided in Table 9.

J502 header		J503 header	
Pin number	Signal	Pin number	Signal
5	GND	1	GND
2	TX	2	TX
3	RX	3	RX
1,4,6,7,8,9	No connect	4	+5V

Table 9 Pinout for J602 and J604 Headers

JTAG Debug Port (J402)

A JTAG interface is provided, allowing the user to download and debug programs directly to the board. This interface is provided on a 2x10 0.100” pitched straight header connector (J402) and provides a JTAG debugging interface to the S3C2410. Pin-out descriptions are provided in Table 10.

Signal	Pin number	Pin number	Signal
+3.3V	1	2	No connect
NC	3	4	GND
TDI	5	6	GND
TMS	7	8	GND
TCK	9	10	GND
NC	11	12	GND
TDO	13	14	GND
NTRST	15	16	GND
No connect	17	18	GND
No connect	19	20	GND

Table 10 Pinout for J402 JTAG Interface Header

Expanded Process I/O (96PIN)

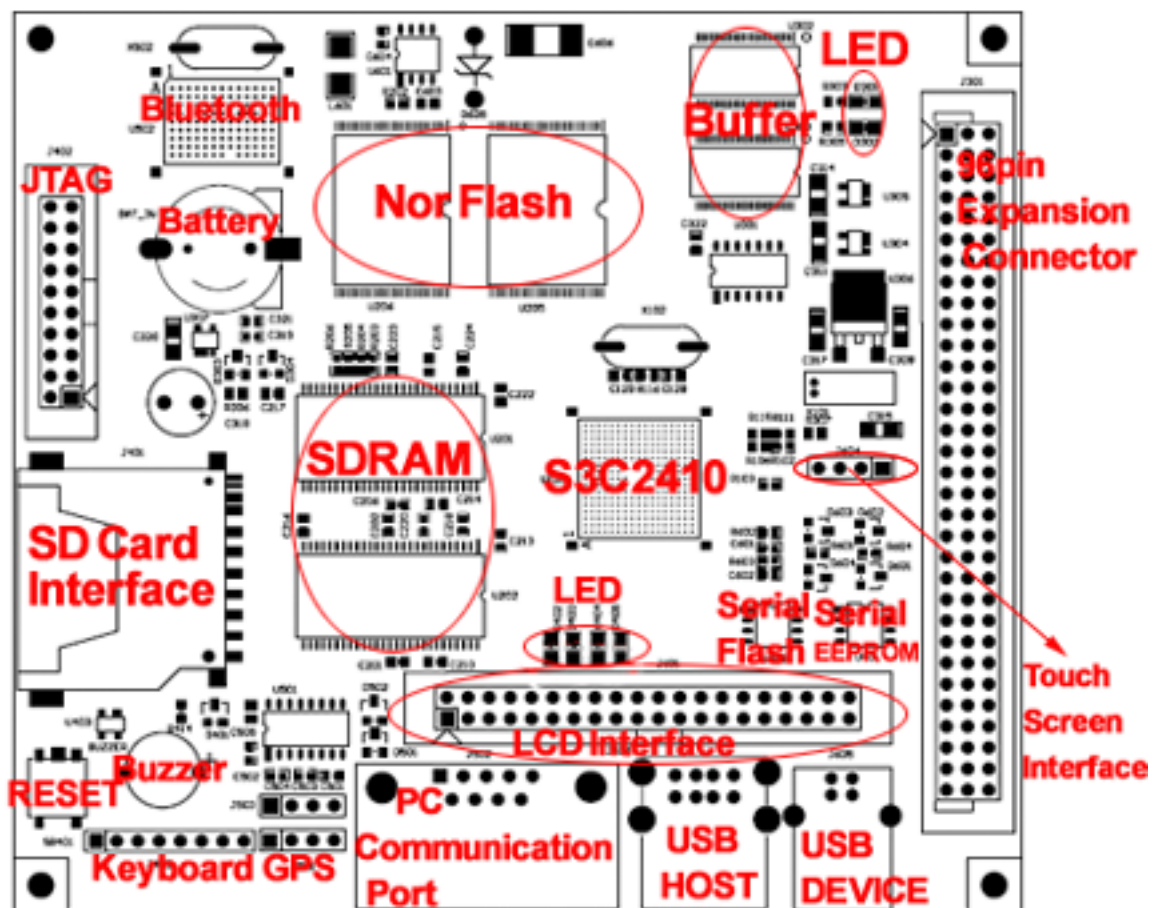
A 96pin Female DIN connector is provided on the SBC2410, providing expanded access to processor signals. This interface can support an additional daughter-card. Included in this array of signals is a +5V power supply, which is useful in powering add-on cards. The pin-out on this connector is provided in Table 11.

A	Signal	Alternate Function	B	Signal	Alternate Function	C	Signal	Alternate Function
1	GND		1	GPA0	ADDR0	1	GND	
2	ADDR1		2	ADDR2		2	ADDR3	
3	ADDR4		3	+3.3V		3	ADDR5	
4	ADDR6		4	ADDR7		4	ADDR8	
5	GND		5	ADDR9		5	GND	
6	ADDR10		6	ADDR11		6	ADDR12	
7	ADDR13		7	+3.3V		7	ADDR14	
8	ADDR15		8	nWE		8	nOE	
9	GND		9	GND		9	GND	
10	DATA0		10	DATA1		10	DATA2	
11	DATA3		11	DATA4		11	DATA5	
12	DATA6		12	DATA7		12	GND	
13	GND		13	GND		13	CLKOUT0	GPH9
14	GPA15	nGCS4	14	GPA16	nGCS5	14	GND	
15	GPA21	nRSTOUT	15	GPB0	TOUT0	15	GPB1	TOUT1
16	GND		16	+5V		16	GND	
17	GPB2	TOUT2	17	GPB3	TOUT3	17	GPB4	TCLK0
18	GND	GPE0	18	I2SLRCK		18	GND	
19	GPE1	I2SSCLK	19	GPE2	CDCLK	19	GPE3	I2SSDI
20	GPE4	I2SSDO	20	+5V		20	GPE11	SPIMISO0
21	GPE12	SPIMOSI0	21	GPE13	SPICLK0	21	GPE14	IICSCL

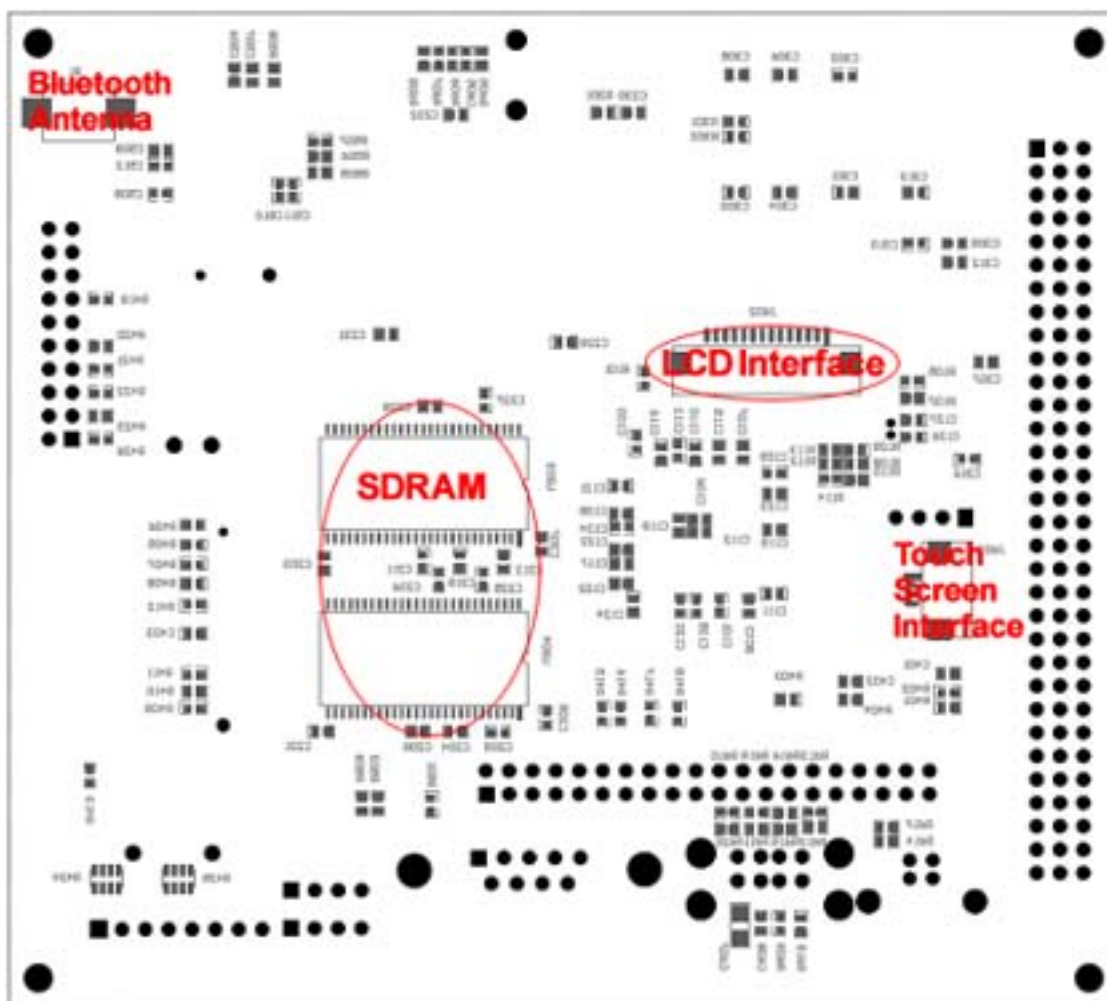
22	GND		22	GPE15	IICSDA	22	GND	
23	GPG0	EINT8	23	GPG1	EINT9	23	GPG2	EINT10
24	GPG11	TCLK1	24	GND		24	GPH0	nCTS0
25	GPH1	nRTS0	25	GPH2	TXD0	25	GPH3	RXD0
26	GND		26	GPH4	TXD1	26	GND	
27	GPH5	RXD1	27	GPH6	TXD2	27	GPH7	RXD2
28	GND		28	GND		28	GND	
29	AIN0		29	AIN1		29	AIN2	
30	GND		30	AIN3		30	GND	
31	AIN4		31	GND		31	AIN5	
32	AIN6		32	AIN7		32	VREF	

Table 11 Expansion Connector Pin-out Descriptions

Layout (including top and bottom)



Embest SBC2410 Single Board Computer top-Layout



Embest SBC2410 Single Board Computer bottom-Layout

Order Information

Order No.	MH2
Item	Embest SBC2410 Single Board Computer
Price	Please contact us for detailed information.
CD-ROM	<ul style="list-style-type: none"> ● testing software for hardware ● user manual ● circuit schematic drawing and PCB Layout ● BOM list ● parts datasheet
Option hardware	320 x 480 MTG-F32240HFWHSEB STN-type LCD 640 x 480 V16C6448AC TFT-type LCD with a specially designed tiny board to supply backlight power and signal switch
Option service	Embest offers custom HW/SW development service based on SBC2410 board. Detailed information please contact us.

Option Tools	<p>Embest IDE for ARM Development Tools Suite I or II, III, include:</p> <ul style="list-style-type: none"> ● IDE, editor, GNU ARM Compiler and Linker, debugger, full registered version ● Embest PowerICE or Embest Emulator, Embest UnetICE ● Embest Flash Programmer
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