AT91SAM9G45-EVK Board

User Manual V1.0

date：2011.02.22

Revision history

Rev	Date	Description
1.0	20110222	Initial version

Catalog

Section 1 Overview

1.1 Scope

The AT91SAM9G45-EVK evaluation kit is an effective platform for evaluating chip performance and developing code for applications based on the AT91SAM9G45 microcontroller.

1.2 Deliverables

The AT91SAM9G45-EVK package contains the following items:

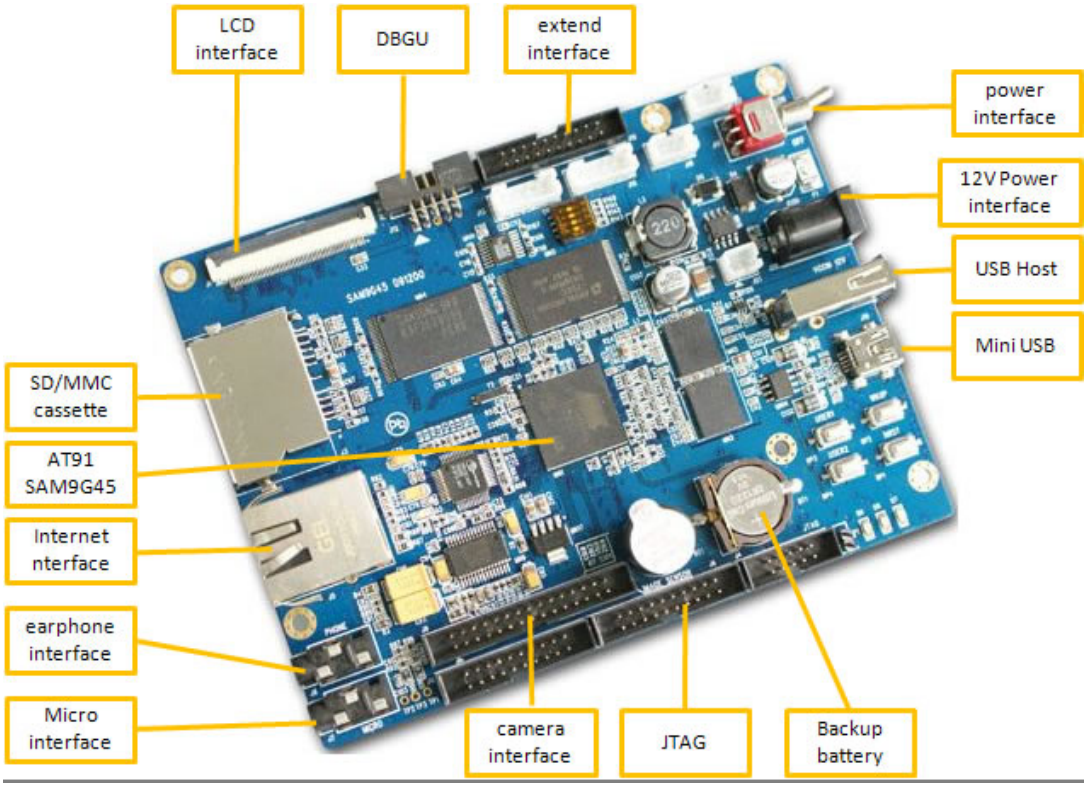
- an AT91SAM9G45-EVK board
- Power Adapter (12V, 1.25A rating)
- IDC10 Cable
- Mini USB Cable
- 10/100 Ethernet Cable
- DB9-IDC10 Cable
- 20Pins-10Pins JTAG Converter
- TFT LCD Panel
- CD ROM

1.3 The AT91SAM9G45-EVK Evaluation Board

The board has got ATMEL AT91SAM9G45 (BGA324 package) microcontroller based on ARM926EJ-S processor operating at 400MHz frequency, and can support WinCE, Linux and Android. The board features the following:

- An external 256MB NandFlash
- An external 1MB NorFlash
- An external 4MB DataFlash
- 2 external 64MB DDR2 SDRAM
- One USB host interface
- One mini USB interface
- Ethernet interface
- Audio interface
- SD card interface
- Micro SD card slot
- LCD interface
- JTAG interface
- one DBGU serial communication port

1.4 AT91SAM9G45-EVKBlock Diagram



1.5 Software resources list

MDK software resources	Please refer to AT91SAM9G45_MDK User Manual
WinCE software resources	Please refer to AT91SAM9G45 WinCE User Manual
Linux software resources	Please refer to AT91SAM9G45 Linux User Manual
Android software resources	Please refer to AT91SAM9G45 Android User Manual

1.6 AT91SAM9G45 Microcontroller

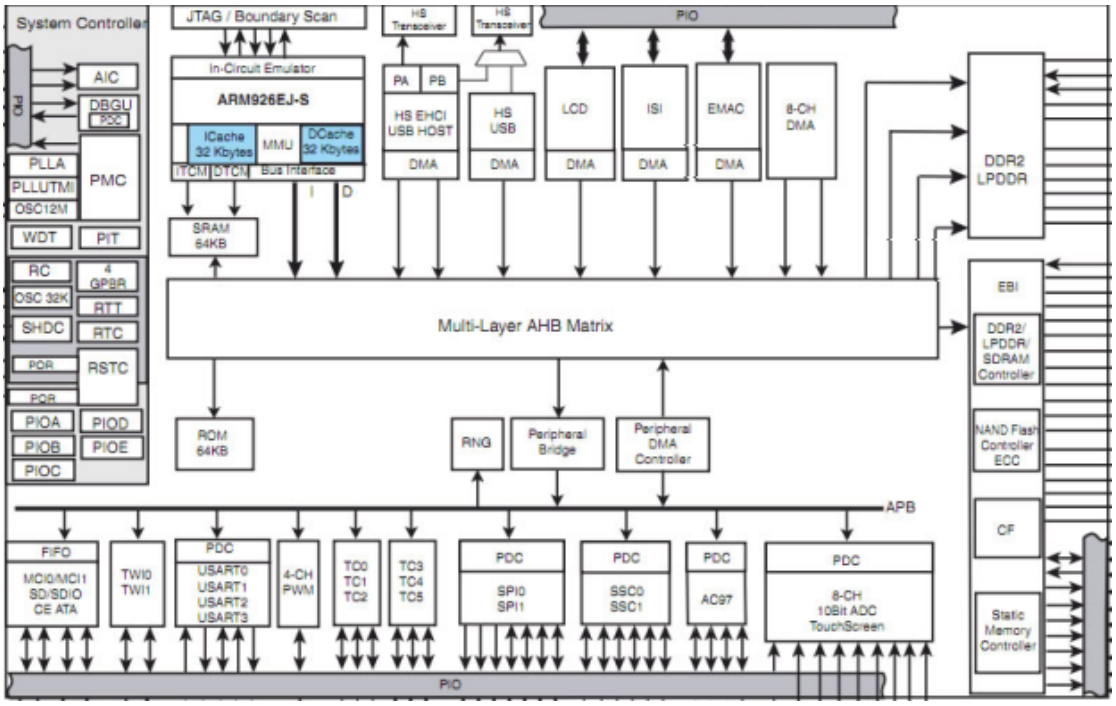
The ARM926EJ-S based AT91SAM9G45 features the frequently demanded combination of user interface functionality and high data rate connectivity, including LCD Controller, resistive touch-screen, camera interface, audio, Ethernet 10/100 and high speed USB and SDIO. With the processor running at 400MHz and multiple 100+ Mbps data rate peripherals, the AT91SAM9G45 has the performance and bandwidth to the network or local storage media to provide an adequate user experience. The AT91SAM9G45 supports the latest generation of DDR2 and NAND Flash memory interfaces for program and data storage. An internal 133 MHz multi-layer bus architecture associated with 37 DMA channels, a dual external bus interface and distributed memory including a 64Kbyte SRAM which can be configured as a tightly coupled memory (TCM) sustains the high bandwidth required by the processor and the high speed peripherals. The I/Os support 1.8V or 3.3V operation, which are independently configurable for the memory interface and peripheral I/Os. This feature completely eliminates the need for any external level shifters. In addition it supports 0.8 ball pitch package for low cost PCB manufacturing.

The AT91SAM9G45 power management controller features efficient clock gating and a battery backup section minimizing power consumption in active and standby modes.

1.7 AT91SAM9G45 Microcontroller Features

- 400 MHz ARM926EJ-SARM Thumb Processor
- 32 KBytes Data Cache,32 KBytes Instruction Cache,MMU
- Dual External Bus Interface supporting 4-bank DDR2/LPDDR,SDRAM/LPSDR, Static Memories,CompactFlash,SLC NAND Flash with ECC
- One 64-kbyte internal SRAM, single-cycle access at system speed or processor speed through TCM interface
- One 64-kbyte internal ROM, embedding bootstrap routine
- LCD Controller supporting STN and TFT displays up to 1280*860
- ITU-R BT.601/656 Image Sensor Interface
- USB Device High Speed, USB Host High Speed and USB Host Full Speed with On-Chip Transceiver
- 10/100 Mbps Ethernet MAC Controller
- Two High Speed Memory Card Hosts (SDIO, SDCard, MMC)
- AC'97 controller
- Two Master/Slave Serial Peripheral Interfaces
- Two Three-channel 32-bit Timer/Counters
- Two Synchronous Serial Controllers (I2S mode)
- Four-channel 16-bit PWM Controller
- Two Two-wire Interfaces
- Four USARTs with ISO7816,IrDA,Manchester and SPI modes
- 8-channel 10-bit ADC with 4-wire Touch Screen support
- 133 MHz twelve 32-bit layer AHB Bus Matrix
- 37 DMA Channels
- Boot from NAND Flash, SDCard, DataFlash or serial DataFlash
- Reset Controller with on-chip Power-on Reset
- Selectable 32768 Hz Low-power and 12 MHz Crystal Oscillators
- Internal Low-power 32 kHz RC Oscillator
- One PLL for the system and one 480 MHz PLL optimized for USB High Speed
- Two Programmable External Clock Signals
- Advanced Interrupt Controller and Debug Unit
- Periodic Interval Timer, Watchdog Timer, Real Time Timer and Real Time Clock

1.8 AT91SAM9G45 Block Diagram



Section 2 Getting Started

2.1 Documents Description

File name / Item	Description	Attribute
AT91SAM9G45-EVK WinCE User Manual	Describes how to download and use WinCE	376KB
AT91SAM9G45-EVK Linux User Manual	Describes how to download and use Linux	212KB
AT91SAM9G45-EVK Android User Manual	Describes how to download and use Android	489KB
AT91SAM9G45-EVK UserManualV1.0.pdf	The first version of the User Manual	813KB
AT91SAM9G45-EVK Board Schematic.pdf	Development board schematic	281KB
AT91SAM9G45 Datasheet.pdf	Datasheet of AT91SAM9G45	1.15MB
AT91SAM9G45 Reference Manual.pdf	Reference Manual of AT91SAM9G45	17.6MB
Other PDF documents	Introduce other modules in the board, such as Audio, NandFlash…	6.36MB

2.2 Version Information

- The version of the development tools: MDK4.01
- The version of the SAM-BA: SAM-BA V2.9

2.3 Hardware resource requirements

Recommended PC system configuration for use with the EBAT91SAM9G45 EVK:

- 2.0GHz (or higher) of the CPU
- 512M RAM
- 2 USB interfaces
- A serial interface
- Windows XP operating system
- KEIL Integrated Development Environment installed

2.4 Preparations

- Jumper Settings: Use the default sets, no need to change any settings.
- Serial Connection: Connect com port of board and the com part of PC through serial port cable.

- LCD Connection: Insert the LCD in the LCD interface of board.
- USB Connection: Using USB cable, plus one end into the Mini USB port on the board, the other end to PC.
- SD Card Connection: Connect SD card to SD socket on the board.
- Micro SD Card Connection: Connect Micro SD card to Micro SD socket on the board.
- JTAG Debugger Connection：One end is connected to JTAG interface on the board，the other to PC (need to use JTAG Adapter).
- Serial Port Receive Settings: In the PC, run HyperTerminal serial communication program, select the serial port used and set the following parameters (to set status: Baud rate (115200), data bits (8 bits), stop bits (1 bit), parity bit (no), data flow control (no)).
- Network Connection: Through the crossover cable provided connect J5 interface on the board and the network interface of PC side.

2.5 How to use and recover the factory program

If the factory program in the ATMEL AT91SAM9G45-EVK Development Board is Windows CE 6.0, please refer to the chapter WinCE download of << AT91SAM9G45-EVK WinCE User Manual >>

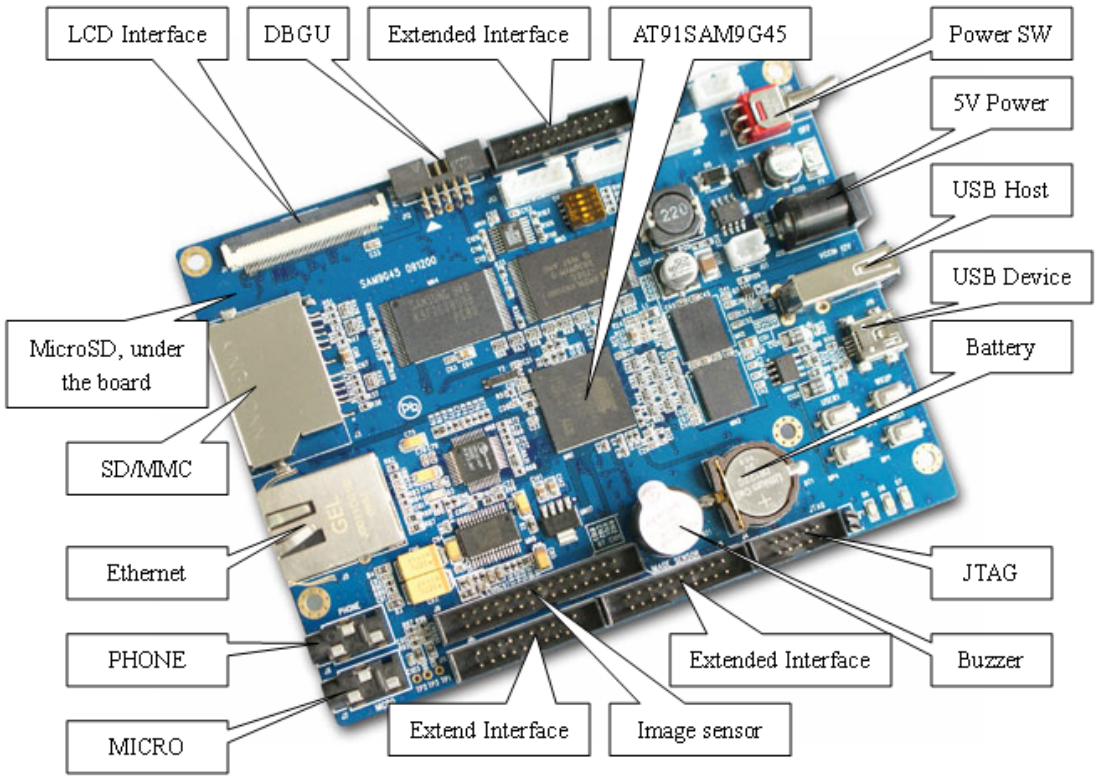
If the factory program in the ATMEL AT91SAM9G45-EVK Development Board is Linux system, please refer to the chapter Linux download of << AT91SAM9G45-EVK Linux User Manual >>

If the factory program in the ATMEL AT91SAM9G45-EVK Development Board is MDK project, please refer to the chapter MDK download of << AT91SAM9G45-EVK_MDK User Manual >>

If the factory program in the ATMEL AT91SAM9G45-EVK Development Board is Android system, please refer to the chapter MDK download of << AT91SAM9G45-EVK_ Android User Manual >>

Section 3 Hardware Description

3.1 Board Interface Overview



J1	LCD interface	J15	USART2 interface
J2	Micro SD card slot	J16	USART0 interface
J3	SD/MMC slot	J17	USART3 interface
J4	JTAG interface	J18	Mini USB
J5	RJ45 ETHERNET interface	J19	Power switch
J6	PHONE output interface	J20	5V power
J7	MICRO input interface	JP1	BMS jumper choose
J8	20-pin expend interface	D6	Power indicator light
J9	20-pin expend interface	D7	User LED
J10	20-pin expend interface	D8	User LED
J11	20-pin expend interface	BP1	Reset button
J12	DBGU interface	BP2	Wakeup button
J13	USART1 interface	BP3	USER1 button
J14	USB Host	BP4	USER2 button

3.2 Board Extended Pins Description

J11	Pins Num	I/O	Peripheral A	Peripheral B	Reset State
	1	+5V			

Extended Pins	2	ground			
	3	hovering			
	4	hovering			
	5	+3V3			
	6	ground			
	7	PA6	MCI0_DA4	ETX2	I/O
	8	PA7	MCI0_DA5	ETX3	I/O
	9	PA8	MCI0_DA6	ETX2	I/O
	10	PA9	MCI0_DA7	ETX3	I/O
	11	PD6	AC97RX		I/O
	12	PD7	AC97TX	TIOA5	I/O
	13	PD8	AC97FS	TIOB5	I/O
	14	PD9	AC97CK	TCLK5	I/O
	15	PD24	SPI0_NPCS1	PWM0	I/O
	16	hovering			
	17	PD26	PCK0	PWM2	I/O
	18	PD25	SPI0_NPCS2	PWM1	I/O
	19	PD30	TIOB0	SCK2	I/O
	20	PD31	TIOB1	PWM1	I/O

J8	Pins Num	I/O	Peripheral A	Peripheral B	Reset State
Extended Pins	1	+5V			
	2	ground			
	3	PB4	TXD1		I/O
	4	PD17	CTS1		I/O
	5	+3V3			
	6	ground			
	7	PB5	RXD1		I/O
	8	PD16	RTS1		I/O
	9	PB6	TXD2		I/O
	10	PB7	RXD2		I/O
	11	PB10	TWD1	ISI_D10	I/O
	12	PB11	TWCK1	ISI_D11	I/O
	13	PA20	TWD0		I/O
	14	PA21	TWCK0		I/O
	15	PB14	SPI1_MISO		I/O
	16	PB15	SPI1_MOSI	CTS0	I/O
	17	PB16	SPI1_SPCK	SCK0	I/O
	18	PB17	SPI1_NPCS0	RTS0	I/O
	19	PD18	SPI1_NPCS2	IRQ	I/O
	20	PD19	SPI1_NPCS3	FIQ	I/O

J9	Pins Num	I/O	Peripheral A	Peripheral B	Reset State
	1	+3V3			
	2	ground			

Extended CMOS camera interface	3	+3V3			
	4	ground			
	5	PD12	TK1	PCK0	I/O
	6	PD13	RK1		I/O
	7	PA21	TWCK0		I/O
	8	PA20	TWD0		I/O
	9	ground			
	10	PB31	ISI_MCK	PCK1	I/O
	11	ground			
	12	PB29	ISI_VSYNC		I/O
	13	ground			
	14	PB30	ISI_HSYNC		I/O
	15	ground			
	16	PB28	ISI_PCK		I/O
	17	ground			
	18	PB20	ISI_D0		I/O
	19	PB21	ISI_D1		I/O
	20	PB22	ISI_D2		I/O
	21	PB23	ISI_D3		I/O
	22	PB24	ISI_D4		I/O
	23	PB25	ISI_D5		I/O
	24	PB26	ISI_D6		I/O
	25	PB27	ISI_D7		I/O
	26	PB8	TXD3	ISI_D8	I/O
	27	PB9	RXD3	ISI_D9	I/O
	28	PB10	TWD1	ISI_D10	I/O
	29	PB11	TWCK1	ISI_D11	I/O
	30	ground			

J10	Pins Num	I/O	Peripheral A	Peripheral B	Reset State
Extended Pins	1	+5V			
	2	ground			
	3	hovering			
	4	hovering			
	5	+3V3			
	6	ground			
	7	PC17	D17		I/O
	8	PC18	D18		I/O
	9	PC19	D19		I/O
	10	PC20	D20		I/O
	11	PC21	D21		I/O
	12	PC22	D22		I/O
	13	PC23	D23		I/O
	14	PC24	D24		I/O
	15	PC25	D25		I/O

	16	PC26	D26		I/O
	17	PC27	D27		I/O
	18	PC28	D28		I/O
	19	hovering			
	20	hovering			

J4	Pins Num	I/O	Description
10-Pin JTAG interface	1	TCK	Can't do anything else
	2	ground	
	3	TDO	
	4	+3V3	
	5	TMS	
	6	NTRST	
	7	RTCK	
	8	NRST	
	9	TDI	
	10	ground	

	Function	Remark	Description
J12	UART(DEBUG)		Can't do anything else
J13	USART1	Have RTS/CTS	
J15	USART2	Have RTS/CTS	
J16	USART0		
J17	USART3		

3.3 Jumpers Settings

ID	Name	Default Settings	Note
JP1	BOOT0	Open	Choose Start-up mode from NandFlash flash or DataFlash
JP2	NANDCS	Close	Select the chip nandflash
JP3	power	Close	Power on the chip

3.4 Hardware Interface Introduction

3.4.1 JTAG

Through the standard 10-pin JTAG connector on the AT91SAM9G45-EVK ARM9 Board, you can connect with any ARM JTAG Emulator such as ULINK2, Jlink etc.

3.4.2 Micro SD Card

A Mini SD Card Interface is implemented on this Board; it can only be used by Mini SD Card.

3.4.3 SD/MMC Card

In addition to the Mini SD Card, the Board also supports SD/MMC cards.

3.4.4 Ethernet

A Physical Layer Transceiver DM9161AEP and an integrated RJ45 interface are implemented in this Board, and it supports both 10BASE-T and 100BASE-TX Ethernet protocol, which ensures compatibility and interoperability with all other standard based Ethernet solutions.

3.4.5 Audio

The AT91SAM9G45-EVK Development Board includes a WM8731 chip which integrates a low-power stereo audio codec chip. WM8731 offers the user the unique ability to independently program the ADC and DAC sample fates from a single clock source. The WM8731 is designed specifically for portable MP3 audio and speech players and recorders.
In this Board, use TWI to transport control command to WM8731, and use SSC to send or receive data from WM8731.

3.4.6 DBUG

AT91SAM9G45-EVK development board provide a 10-pin UART debug interface, can be converted it to 9-pin common RS-232 interface with the provided adapter. This DBGU port that can be used for communication and trace purposes. It offers an ideal channel for ISP downloading.

3.4.7 LCD & Touch Screen Controller

AT91SAM9G45-EVK ARM9 Board provides a three kinds of TFT LCD with a Touch Screen Controller, LCD 4.3 inch（480x272）,LCD 7.0 inch（800x480）,LCD 10.2 inch（800x480）(Notice: If you use the AT91SAM9G45-EVK board, you must solder the corresponding resistance on the LCD)

LCD inch	The position of welding the resistance	Welding the size of the resistance
LCD_4.3	Back C13	220K
LCD_7.0	Back C19	220K
LCD_10.2	Back C22	220K

3.4.8 Mini USB Port

A USB Mini AB interface is implemented to transport USB data, and it also supports USB-OTG full speed.

3.4.9 EEPROM

A 512KB EEPROM is connected to the TWI0 bus in AT91SAM9G45-EVK ARM9 Board. We can serial access this EPPROM through TWI0.

3.4.10 User Buttons

This Board provides two user buttons, USER1 and USER2; they respectively connect with PB7 and PB6 pins.

3.4.11 LED

AT91SAM9G45-EVK ARM9 Board provides 3 LEDs D6, D7 and D8, they respectively connect with PD30, PD31 and PD0 IO pins, D6 indicates the Power, D7 and D8 can be used for user outputs.

Appendix A: After-sales Service

Customer Service

Please contact Premier Farnell local sales and customer services staffs for the help.
Website: http://www.farnell.com/

Technical Support

Please contact Premier Farnell local technical support team for any technical issues through the telephone, live chat & mail, or post your questions on the below micro site, we will reply to you as soon as possible.

Centralized technical support mail box: knode_tech@element14.com

Community: http://www.element14.com/community/community/knode/dev_platforms_kits

Please visit the below micro site to download the latest documents and resources code:
http://www.element14.com/community/community/new_technology/at91sam9g45-evk

Notes

This board was designed by element14's design partner- Embest, you can contact them to get the technical support as well.

Marketing Department:
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