INTRODUCTION:

Atmel’s AT91SAM7S256 is a member of a series of low pincount Flash microcontrollers based on the 32-bit ARM RISC processor. It features a 256 Kbyte high-speed Flash and a 64 Kbyte SRAM, a large set of peripherals, including a USB 2.0 device, and a complete set of system functions minimizing the number of external components. The device is an ideal migration path for 8-bit microcontroller users looking for additional performance and extended memory.

The embedded Flash memory can be programmed in-system via the JTAG-ICE interface or via a parallel interface on a production programmer prior to mounting. Built-in lock bits and a security bit protect the firmware from accidental overwrite and preserves its confidentiality.

The AT91SAM7S256 system controller includes a reset controller capable of managing the power-on sequence of the microcontroller and the complete system. Correct device operation can be monitored by a built-in brownout detector and a watchdog running off an integrated RC oscillator.

The AT91SAM7S256 is a general-purpose microcontroller. Its integrated USB Device port makes it an ideal device for peripheral applications requiring connectivity to a PC or cellular phone. Its aggressive price point and high level of integration pushes its scope of use far into the cost-sensitive, high-volume consumer market.

BOARD FEATURES:

- Microcontroller: AT91SAM7S256 16/32 bit ARM7TDMI™ with 256K Bytes Program Flash, 64K Bytes RAM, USB 2.0, RTT, 10 bit ADC 384 ksp, 2x UARTs, TWI (I2C), SPI, 3x 32bit TIMERS, 4x PWM, SSC, WDT, PDC (DMA) for all peripherals, up to 60MHz operation
- standard JTAG connector with ARM 2x10 pin layout for programming/debugging with ARM-JTAG
- USB connector
- Two channel RS232 interface and drivers
- SD/MMC card connector
- two buttons
- trimpot connected to ADC
- thermistor connected to ADC
- two status LEDs
- on board voltage regulator 3.3V with up to 800mA current
- single power supply: 6V AC or DC required
- power supply LED
- power supply filtering capacitor
- RESET circuit
- RESET button
• 18.432 Mhz crystal on socket
• extension headers for all microcontroller's ports
• PCB: FR-4, 1.5 mm (0.062"), soldermask, silkscreen component print
• Dimensions: 120 x 80 mm (4.7 x 3.15")

ELECTROSTATIC WARNING:

The SAM7-P256 board is shipped in protective anti-static packaging. The board must not be subject to high electrostatic potentials. General practice for working with static sensitive devices should be applied when working with this board.

BOARD USE REQUIREMENTS:

Cables: The cable you will need depends on the programmer/debugger you use. If you use ARM-JTAG-EW, you will need USB A-B cable.

Hardware: Programmer/Debugger ARM-JTAG-EW or other compatible programming/debugging tool if you work with EW-ARM.

You can use also ARM-USB-OCD, ARM-USB-TINY, ARM-USB-TINY-H.

PROCESSOR FEATURES:

SAM7-P256 board use AT91 ARM Thumb-based microcontroller AT91SAM7S256 from Atmel Corporation with these features:

- High-performance 32-bit RISC Architecture
- High-density 16-bit Instruction Set
- Leader in MIPS/Watt
- EmbeddedICE™ In-circuit Emulation, Debug Communication Channel Support
- Internal High-speed Flash
  - 256 Kbytes Organized in 1024 Pages of 256 Bytes (Single Plane)
  - Single Cycle Access at Up to 30 MHz in Worst Case Conditions
  - Prefetch Buffer Optimizing Thumb Instruction Execution at Maximum Speed
  - Page Programming Time: 6 ms, Including Page Auto-erase, Full Erase Time: 15 ms
  - 10,000 Write Cycles, 10-year Data Retention Capability, Sector Lock Capabilities, Flash Security Bit
  - Fast Flash Programming Interface for High Volume Production
- Internal High-speed SRAM, Single-cycle Access at Maximum Speed
- 64 Kbytes
- Memory Controller (MC)
  - Embedded Flash Controller, Abort Status and Misalignment Detection
- Reset Controller (RSTC)
  - Based on Power-on Reset and Low-power Factory-calibrated Brown-out Detector
  - Provides External Reset Signal Shaping and Reset Source Status
- Clock Generator (CKGR)
  - Low-power RC Oscillator, 3 to 20 MHz On-chip Oscillator and one PLL
- Power Management Controller (PMC)
  - Software Power Optimization Capabilities, Including Slow Clock Mode (Down to 500 Hz) and Idle Mode
  - Three Programmable External Clock Signals
- Advanced Interrupt Controller (AIC)
  - Individually Maskable, Eight-level Priority, Vectored Interrupt Sources
  - Two External Interrupt Source(s) and One Fast Interrupt Source, Spurious Interrupt Protected
- Debug Unit (DBGU)
  - 2-wire UART and Support for Debug Communication Channel interrupt, Programmable ICE Access Prevention
  - Mode for General Purpose 2-wire UART Serial Communication
- Periodic Interval Timer (PIT)
  - 20-bit Programmable Counter plus 12-bit Interval Counter
- Windowed Watchdog (WDT)
  - 12-bit key-protected Programmable Counter
  - Provides Reset or Interrupt Signals to the System
  - Counter May Be Stopped While the Processor is in Debug State or in Idle Mode
- Real-time Timer (RTT)
  - 32-bit Free-running Counter with Alarm
  - Runs Off the Internal RC Oscillator
- One Parallel Input/Output Controller (PIOA)
  - Thirty-two Programmable I/O Lines Multiplexed with up to Two Peripheral I/Os
  - Input Change Interrupt Capability on Each I/O Line
  - Individually Programmable Open-drain, Pull-up resistor and Synchronous Output
- Eleven Peripheral DMA Controller (PDC) Channels
- One USB 2.0 Full Speed (12 Mbits per Second) Device Port
  - On-chip Transceiver, 328-byte Configurable Integrated FIFOs
- One Synchronous Serial Controller (SSC)
  - Independent Clock and Frame Sync Signals for Each Receiver and Transmitter
  - I²S Analog Interface Support, Time Division Multiplex Support
  - High-speed Continuous Data Stream Capabilities with 32-bit Data Transfer
- Two Universal Synchronous/Asynchronous Receiver Transmitters (USART)
  - Individual Baud Rate Generator, IrDA® Infrared Modulation/Demodulation
  - Support for ISO7816 T0/T1 Smart Card, Hardware Handshaking, RS485 Support
  - Full Modem Line Support on USART1
- One Master/Slave Serial Peripheral Interface (SPI)
  - 8- to 16-bit Programmable Data Length, Four External Peripheral Chip Selects
- One Three-channel 16-bit Timer/Counter (TC)
  - Three External Clock Input and Two Multi-purpose I/O Pins per Channel
  - Double PWM Generation, Capture/Waveform Mode, Up/Down Capability
- One Four-channel 16-bit PWM Controller (PWMC)
- One Two-wire Interface (TWI)
  - Master Mode Support Only, All Two-wire Atmel EEPROMs and I²C Compatible Devices Supported
- One 8-channel 10-bit Analog-to-Digital Converter, Four Channels Multiplexed with Digital I/Os
- SAM-BA™ Boot Assistant
  - Default Boot program
  - Interface with SAM-BA Graphic User Interface
- IEEE® 1149.1 JTAG Boundary Scan on All Digital Pins
- 5V-tolerant I/Os, including Four High-current Drive I/O lines, Up to 16 mA Each
- Power Supplies
  - Embedded 1.8V Regulator, Drawing up to 100 mA for the Core and External Components
  - 3.3V or 1.8V VDDIO I/O Lines Power Supply, Independent 3.3V VDDFLASH Flash Power Supply
- 1.8V VDDCORE Core Power Supply with Brown-out Detector
- Fully Static Operation: Up to 55 MHz at 1.65V and 85°C Worst Case Condition
MEMORY MAP:

[Diagram of memory map with detailed allocation of memory for Flash, Internal Flash, Internal SRAM, etc.]

Note:
1) Can be Flash or SRAM depending on REMAP.

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POWER SUPPLY CIRCUIT:

SAM7-P256 is typically power supplied with 6 VDC.
The programmed board power consumption is about 30 mA.

RESET CIRCUIT:

SAM7-P256 reset circuit includes U5 (MCP130T), R8 (10k), pin 15 of JTAG connector, pin 39 (NRST) of AT91SAM7S256 and RESET button.

CLOCK CIRCUIT:

Quartz crystal Q1 18.432 MHz is connected to AT91SAM7S256 pin 61 (XOUT) and pin 62 (XIN).

JUMPER DESCRIPTION:

<table>
<thead>
<tr>
<th>Jumper</th>
<th>Position</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOS</td>
<td></td>
<td>Enable normal mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The pin JTAGSEL is used to select the JTAG boundary scan.</td>
</tr>
<tr>
<td>TST</td>
<td></td>
<td>Enable normal mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The pin TST is used for manufacturing test or fast programming mode.</td>
</tr>
<tr>
<td>RXD0/DRX0</td>
<td></td>
<td>RS232_0 is not connected</td>
</tr>
<tr>
<td>TXD0/DTX0</td>
<td></td>
<td>RS232_0 is connected to RXD0 and TXD0 (USART0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RS232_0 is connected to DRX0 and DTX0 which is used in programming mode - via COM Port</td>
</tr>
<tr>
<td>LED_J</td>
<td></td>
<td>Green led is not connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green led connected to PA17 / TD / PCK1 / ADD (PIN 9)</td>
</tr>
<tr>
<td>LED_1</td>
<td></td>
<td>Yellow led is not connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yellow led connected to PA19 R0 PCK2 AD1 (PIN 10)</td>
</tr>
<tr>
<td>VREF_P</td>
<td></td>
<td>ADREF pin (PIN 1) is connected to VREF pin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ADREF pin (PIN 1) is connected to 3.3V</td>
</tr>
</tbody>
</table>
**Description for programming via RS232 0/D COM port, when is SAM-BA software**

The AT91SAM7S256 can be programmed via COM port using the SAM-BA™ software. Before being able to use SAM-BA, a recovery procedure, which consists of copying the SAM-BA Boot Assistant into Flash must be performed as follows:

1. Power down the AT91SAM7S256
2. Close jumper TST
3. Power up the AT91SAM7S256
4. Wait 10 sec
5. Power down the AT91SAM7S256
6. Remove jumper TST
7. Power up the AT91SAM7S256

Note: For programming via COM port, you must set jumpers RXD0/DRXD and TXD0/DTXD, according to jumpers description above.

**INPUT/OUTPUT:**

- **Status Led (green)** with name **GREEN** connected via jumper **LED1** to AT91SAM7S256 pin 10 (PA18/RD/PCK2/AD1).
- **Status Led (yellow)** with name **YELLOW** connected via jumper **LED2** to AT91SAM7S256 pin 9 (PPA17/TD/PCK1/AD0).
- **Power-on LED (red)** with name **PWR_LED** – this LED shows that +3.3V is applied to the board.

- **User button** with name **B1** connected to AT91SAM7S256 pin 13 (PA19/RK/FIQ/AD2).
- **User button** with name **B2** connected to AT91SAM7S256 pin 16 (PA20/RF/IRQ0/AD3).
- **User button** with name **RESET** connected to AT91SAM7S256 pin 39 (NRST).
- **Trimpot** with name **AN_TR** connected to AT91SAM7S256 pin 3 (AD4).
- **Thermistor** with name **TH1** connected to AT91SAM7S256 pin 4 (AD5).
EXTERNAL CONNECTORS DESCRIPTION:

RS232_0/D:

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
</tr>
<tr>
<td>2</td>
<td>TX0OUT</td>
</tr>
<tr>
<td>3</td>
<td>RX0IN</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
</tr>
<tr>
<td>6</td>
<td>NC</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
</tr>
<tr>
<td>8</td>
<td>NC</td>
</tr>
<tr>
<td>9</td>
<td>NC</td>
</tr>
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</table>

RS232_1:

<table>
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<th>Pin #</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
</tr>
<tr>
<td>2</td>
<td>TX1OUT</td>
</tr>
<tr>
<td>3</td>
<td>RX1IN</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
</tr>
<tr>
<td>6</td>
<td>NC</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
</tr>
<tr>
<td>8</td>
<td>NC</td>
</tr>
<tr>
<td>9</td>
<td>NC</td>
</tr>
</tbody>
</table>
PWR JACK:

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power Input</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
</tr>
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</table>

UEXT:

<table>
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<tr>
<th>Pin #</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.3V</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
</tr>
<tr>
<td>3</td>
<td>TXD1</td>
</tr>
<tr>
<td>4</td>
<td>RXD1</td>
</tr>
<tr>
<td>5</td>
<td>TWCK</td>
</tr>
<tr>
<td>6</td>
<td>TWD</td>
</tr>
<tr>
<td>7</td>
<td>MISO</td>
</tr>
<tr>
<td>8</td>
<td>MOSI</td>
</tr>
<tr>
<td>9</td>
<td>SPCK</td>
</tr>
<tr>
<td>10</td>
<td>NPCs1</td>
</tr>
</tbody>
</table>

JTAG:

The JTAG connector allows the software debugger to talk via a JTAG (Joint Test Action Group) port directly to the core. Instructions may be inserted and executed by the core thus allowing AT91SAM7S256 memory to be programmed with code and executed step by step by the host software.

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Signal Name</th>
<th>Pin #</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.3V</td>
<td>2</td>
<td>3.3V</td>
</tr>
<tr>
<td>3</td>
<td>TRST</td>
<td>4</td>
<td>GND</td>
</tr>
<tr>
<td>5</td>
<td>TDI</td>
<td>6</td>
<td>GND</td>
</tr>
<tr>
<td>7</td>
<td>TMS</td>
<td>8</td>
<td>GND</td>
</tr>
<tr>
<td>9</td>
<td>TCK</td>
<td>10</td>
<td>GND</td>
</tr>
<tr>
<td>11</td>
<td>RTCK</td>
<td>12</td>
<td>GND</td>
</tr>
<tr>
<td>13</td>
<td>TDO</td>
<td>14</td>
<td>GND</td>
</tr>
<tr>
<td>15</td>
<td>RST</td>
<td>16</td>
<td>GND</td>
</tr>
<tr>
<td>17</td>
<td>NC</td>
<td>18</td>
<td>GND</td>
</tr>
<tr>
<td>19</td>
<td>NC</td>
<td>20</td>
<td>GND</td>
</tr>
</tbody>
</table>

**USB**

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+5V_USB</td>
</tr>
<tr>
<td>2</td>
<td>DDM</td>
</tr>
<tr>
<td>3</td>
<td>DDP</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
</tr>
</tbody>
</table>

**SD/MMC**

Page 15
<table>
<thead>
<tr>
<th>Pin #</th>
<th>Signal Name</th>
<th>Pin #</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NPCS0</td>
<td>2</td>
<td>MOSI</td>
</tr>
<tr>
<td>3</td>
<td>GND (VSS1)</td>
<td>4</td>
<td>VDD</td>
</tr>
<tr>
<td>5</td>
<td>SPCK</td>
<td>6</td>
<td>GND (VSS2)</td>
</tr>
<tr>
<td>7</td>
<td>MISO</td>
<td>8</td>
<td>Via R30 (47k) to 3.3V</td>
</tr>
<tr>
<td>9</td>
<td>Via R31 (47k) to 3.3V</td>
<td>10</td>
<td>WP</td>
</tr>
<tr>
<td>11</td>
<td>Via R19 (2k) to GND</td>
<td>12</td>
<td>Via R24 (2k) to GND</td>
</tr>
<tr>
<td>13</td>
<td>CP</td>
<td>14</td>
<td>Via R19 (2k) to GND</td>
</tr>
<tr>
<td>15</td>
<td>Via R24 (2k) to GND</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
EXTENSION PORT

3.3V
+5V_USB
RST
PA0
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PA8
PA9
PA10
PA11
PA12
PA13
PA14
PA15
PA23
PA25
PA26
PA27
PA28
PA29
PA30
PA31
AD6
AD7
VREF
GND
AVAILABLE DEMO SOFTWARE:

- SAM7-P256 blinking LED project and binary code for SAM-BA load
- SAM7-P256 sample mouse driver project
- UART routines project
- SD/MMC read/write routines project
- button read, temperature measurement project
- MOD-SMB380 read demo code for EW-ARM 4.11 with SAM7-P64/256 board
- USB virtual COM port for GCC+OpenOCD+Eclipse
- OpenOCD + Eclipse set of projects 1.00 include flash write make file for SAM7-P256
ORDER CODE:

SAM7-P256 - assembled and tested board

How to order?

You can order to us directly or by any of our distributors. Check our web www.olimex.com/dev for more info.

Revision history:

Revision F, August 2008
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