

Description

The Atmel® | SMART SAM3S series is a member of a family of Flash microcontrollers based on the high performance 32-bit ARM® Cortex®-M3 processor. It operates at a maximum speed of 64 MHz and features up to 256 Kbytes of Flash and up to 48 Kbytes of SRAM. The peripheral set includes a Full Speed USB Device port with embedded transceiver, a High Speed MCI for SDIO/SD/MMC, an External Bus Interface featuring a Static Memory Controller providing connection to SRAM, PSRAM, NOR Flash, LCD Module and NAND Flash, 2x USARTs, 2x UARTs, 2x TWIs, 3x SPI, an I2S, as well as 1 PWM timer, two 3-channel general-purpose 16-bit timers an RTC, an ADC, a 12-bit DAC and an analog comparator.

The SAM3S device is a medium range general purpose microcontroller with the best ratio in terms of reduced power consumption, processing power and peripheral set. This enables the SAM3S to sustain a wide range of applications including consumer, industrial control, and PC peripherals.

It operates from 1.62V to 3.6V and is available in 48-, 64- and 100-pin QFP, 48- and 64-pin QFN, and 100-pin TFBGA packages.

The SAM3S series is the ideal migration path from the SAM7S series for applications that require more performance. The SAM3S series is pin-to-pin compatible with the SAM3N, SAM4S series (64- and 100-pin versions) and SAM7S series (64-pin versions).

Features

- Core
 - ARM® Cortex®-M3 revision 2.0 running at up to 64 MHz
 - Memory Protection Unit (MPU)
 - Thumb®-2 instruction set
- Pin-to-pin compatible with AT91SAM7S series (48- and 64-pin versions)
- Memories
 - From 64 to 256 Kbytes embedded Flash, 128-bit wide access, memory accelerator, single plane
 - From 16 to 48 Kbytes embedded SRAM
 - 16 Kbytes ROM with embedded bootloader routines (UART, USB) and IAP routines
 - 8-bit Static Memory Controller (SMC): SRAM, PSRAM, NOR and NAND Flash support
 - Memory Protection Unit (MPU)
- System
 - Embedded voltage regulator for single supply operation
 - Power-on-Reset (POR), Brown-out Detector (BOD) and Watchdog for safe operation
 - Quartz or ceramic resonator oscillators: 3 to 20 MHz main power with Failure Detection and optional low power 32.768 kHz for RTC or device clock
 - High precision 8/12 MHz factory trimmed internal RC oscillator with 4 MHz default frequency for device startup. In-application trimming access for frequency adjustment
 - Slow Clock Internal RC oscillator as permanent low-power mode device clock
 - Two PLLs up to 130 MHz for device clock and for USB
 - Temperature Sensor
 - Up to 22 peripheral DMA (PDC) channels
- Low Power Modes
 - Sleep and Backup modes, down to 1.8 µA in Backup mode
 - Ultra low power RTC
- Peripherals
 - USB 2.0 Device: 12 Mbps, 2668 byte FIFO, up to 8 bidirectional Endpoints. On-Chip Transceiver
 - Up to 2 USARTs with ISO7816, IrDA®, RS-485, SPI, Manchester and Modem Mode
 - Two 2-wire UARTs
 - Up to 2 Two Wire Interface (I2C compatible), 1 SPI, 1 Serial Synchronous Controller (I2S), 1 High Speed Multimedia Card Interface (SDIO/SD Card/MMC)
 - Up to two 3-channel 16-bit Timer Counters with capture, waveform, compare and PWM mode. Quadrature Decoder Logic and 2-bit Gray Up/Down Counter for Stepper Motor
 - 4-channel 16-bit PWM with Complementary Output, Fault Input, 12-bit Dead Time Generator Counter for Motor Control
 - 32-bit Real-time Timer and RTC with calendar and alarm features
 - Up to 15-channel, 1Msps ADC with differential input mode and programmable gain stage
 - One 2-channel 12-bit 1Msps DAC
 - One Analog Comparator with flexible input selection, Selectable input hysteresis
 - 32-bit Cyclic Redundancy Check Calculation Unit (CRCCU)
 - Write Protected Registers

- I/O
 - Up to 79 I/O lines with external interrupt capability (edge or level sensitivity), debouncing, glitch filtering and on-die Series Resistor Termination
 - Three 32-bit Parallel Input/Output Controllers, Peripheral DMA assisted Parallel Capture Mode
- Packages
 - 100-lead LQFP, 14 x 14 mm, pitch 0.5 mm/100-ball TFBGA, 9 x 9 mm, pitch 0.8 mm
 - 64-lead LQFP, 10 x 10 mm, pitch 0.5 mm/64-pad QFN 9x9 mm, pitch 0.5 mm
 - 48-lead LQFP, 7 x 7 mm, pitch 0.5 mm/48-pad QFN 7x7 mm, pitch 0.5 mm

1. Configuration Summary

The SAM3S microcontrollers differ in memory size, package and features list. [Table 1-1](#) below summarizes the configurations of the device family

Table 1-1. Configuration Summary

| Device | Flash | SRAM | Timer Counter Channels | GPIOs | UART/ USARTs | ADC | 12-bit DAC Output | External Bus Interface | HSMCI | Package |
|---------|-------------------------|-----------|------------------------|-------|--------------------|--------|-------------------|--|---------------|------------------|
| SAM3S4C | 256 Kbytes single plane | 48 Kbytes | 6 | 79 | 2/2 ⁽¹⁾ | 15 ch. | 2 | 8-bit data, 4 chip selects, 24-bit address | 1 port 4 bits | LQFP100 TFBGA100 |
| SAM3S4B | 256 Kbytes single plane | 48 Kbytes | 6 ⁽²⁾ | 47 | 2/2 ⁽¹⁾ | 10 ch. | 2 | - | 1 port 4 bits | LQFP64 QFN 64 |
| SAM3S4A | 256 Kbytes single plane | 48 Kbytes | 6 ⁽²⁾ | 34 | 2/1 | 8 ch. | - | - | - | LQFP48 QFN 48 |
| SAM3S2C | 128 Kbytes single plane | 32 Kbytes | 6 | 79 | 2/2 ⁽¹⁾ | 15 ch. | 2 | 8-bit data, 4 chip selects, 24-bit address | 1 port 4 bits | LQFP100 TFBGA100 |
| SAM3S2B | 128 Kbytes single plane | 32 Kbytes | 6 ⁽²⁾ | 47 | 2/2 ⁽¹⁾ | 10 ch. | 2 | - | 1 port 4 bits | LQFP64 QFN 64 |
| SAM3S2A | 128 Kbytes single plane | 32 Kbytes | 6 ⁽²⁾ | 34 | 2/1 | 8 ch. | - | - | - | LQFP48 QFN 48 |
| SAM3S1C | 64 Kbytes single plane | 16 Kbytes | 6 | 79 | 2/2 ⁽¹⁾ | 15 ch. | 2 | 8-bit data, 4 chip selects, 24-bit address | 1 port 4 bits | LQFP100 TFBGA100 |
| SAM3S1B | 64 Kbytes single plane | 16 Kbytes | 6 ⁽²⁾ | 47 | 2/2 ⁽¹⁾ | 10 ch. | 2 | - | 1 port 4 bits | LQFP64 QFN 64 |
| SAM3S1A | 64 Kbytes single plane | 16 Kbytes | 6 ⁽²⁾ | 34 | 2/1 | 8 ch. | - | - | - | LQFP48 QFN 48 |

- Notes:
1. Full Modem support on USART1.
 2. Three TC channels are reserved for internal use.

44. Ordering Information

Table 44-1. Ordering Codes for SAM3S Series Devices

| Ordering Code | MRL A | MRL B | Flash (Kbytes) | Package | Temperature Operating Range |
|---------------|-------|-------|----------------|----------|-----------------------------|
| ATSAM3S4CA-AU | A | – | 256 | QFP100 | Industrial -40°C to 85°C |
| ATSAM3S4CA-CU | A | – | 256 | TFBGA100 | Industrial -40°C to 85°C |
| ATSAM3S4BA-AU | A | – | 256 | QFP64 | Industrial -40°C to 85°C |
| ATSAM3S4BA-MU | A | – | 256 | QFN64 | Industrial -40°C to 85°C |
| ATSAM3S4AA-AU | A | – | 256 | QFP48 | Industrial -40°C to 85°C |
| ATSAM3S4AA-MU | A | – | 256 | QFN48 | Industrial -40°C to 85°C |
| ATSAM3S2CA-AU | A | – | 128 | QFP100 | Industrial -40°C to 85°C |
| ATSAM3S2CA-CU | A | – | 128 | TFBGA100 | Industrial -40°C to 85°C |
| ATSAM3S2BA-AU | A | – | 128 | QFP64 | Industrial -40°C to 85°C |
| ATSAM3S2BA-MU | A | – | 128 | QFN64 | Industrial -40°C to 85°C |
| ATSAM3S2AA-AU | A | – | 128 | QFP48 | Industrial -40°C to 85°C |
| ATSAM3S2AA-MU | A | – | 128 | QFN48 | Industrial -40°C to 85°C |
| ATSAM3S1CA-AU | A | – | 64 | QFP100 | Industrial -40°C to 85°C |
| ATSAM3S1CA-CU | A | – | 64 | TFBGA100 | Industrial -40°C to 85°C |
| ATSAM3S1BA-AU | A | – | 64 | QFP64 | Industrial -40°C to 85°C |
| ATSAM3S1BA-MU | A | – | 64 | QFN64 | Industrial -40°C to 85°C |
| ATSAM3S1AA-AU | A | – | 64 | QFP48 | Industrial -40°C to 85°C |
| ATSAM3S1AA-MU | A | – | 64 | QFN48 | Industrial -40°C to 85°C |
| ATSAM3S1CB-AU | – | B | 64 | QFP100 | Industrial -40°C to 85°C |
| ATSAM3S1CB-CU | – | B | 64 | TFBGA100 | Industrial -40°C to 85°C |
| ATSAM3S1BB-AU | – | B | 64 | QFP64 | Industrial -40°C to 85°C |

Table 44-1. Ordering Codes for SAM3S Series Devices (Continued)

| Ordering Code | MRL A | MRL B | Flash (Kbytes) | Package | Temperature Operating Range |
|----------------------|--------------|--------------|---------------------------|----------------|--|
| ATSAM3S1BB-MU | – | B | 64 | QFN64 | Industrial -40°C to 85°C |
| ATSAM3S1AB-AU | – | B | 64 | QFP48 | Industrial -40°C to 85°C |
| ATSAM3S1AB-MU | – | B | 64 | QFN48 | Industrial -40°C to 85°C |