

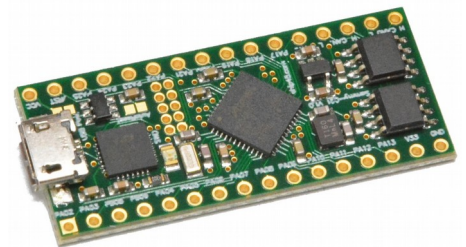
OEM module with Atmel/Microchip ATSAMC21 processor, USB UART and dual CAN.

Available Options

Module	Processor	Flash	RAM	Peripherals on Module
Sammy-C21 V1.0	SAMC21G18A-MU	256kB	32k	<ul style="list-style-type: none">- 3.3V LDO voltage regulator- CP2102 USB UART converter (micro USB connector)- dual ATA6561 CAN transceiver- status LED- 16MHz main crystal- 32768Hz clock crystal- 10pin standard SWD program and debug connector

Module Overview

The Sammy-C21 module comes in a standard DIL32 form factor. Based on Atmel/Microchip's SAMC21G18A microcontroller in 48pin package, the module provides many standard peripherals, like UART, SPI, TWI/I²C, Timers, PWM, ADC, DAC, analog comparator, watchdog and many more. Special feature of the SAMC21 are two integrated Controller Area Network (CAN) controllers complemented with two industry standard CAN transceivers, thus allowing the Sammy-C21 to directly connect to CAN busses. For simple host PC connection a USB UART converter with micro USB connector is present. Further components are a 5V->3.3V voltage regulator, 16MHz main crystal, 32768Hz clock crystal, standard SWD program and debug connector and a status LED.



Microcontroller

Atmel/Microchip's SAMC21G18A provides a powerful Cortex-M0+ CPU running at up to 48MHz, 256kB flash memory, 8kB flash for EEPROM emulation, 32kB SRAM main memory plus an extensive set of microcontroller peripherals (see table right). For a full description of the SAMC21G18A plus data sheet and comprehensive application notes, see the following link:

<http://www.microchip.com/wwwproducts/en/ATSAMC21G18A>

Expansion Headers

All relevant MCU signals are available on two 16-pin expansion headers with standard 2.54mm (1/10") spacing and hole size to fit almost any pin or receptacle headers. With pin headers, the module can be plugged into solderless breadboard or wirewrap PCBs easily. See „Pinout and Dimensions“ for signal and pin configuration.

USB Interface

The USB interface is based on a CP2102 USB UART converter chipset by Silicon Labs. It is connected to SAMC21's SERCOM5 UART (PB02, PB03) and once connected to a PC or MAC, it will show up as virtual serial COM port. Driver installation is not necessary on current Windows or OS X version, but for older systems a virtual COM port driver is available.

See the following link for details on the CP2102 (e.g. data sheet) and optional virtual COM port driver:

<https://www.silabs.com/products/interface/usb-bridges/classic-usb-bridges/device.cp2102>

Parameter Name	Value
Family	SAM C21
Max Speed MHz	48
Program Memory Size (KB)	256
RAM (KB)	32
Auxiliary Flash (KB)	8
Temperature Range (C)	-40 to 85
Operating Voltage Range (V)	2.7 to 5.5
DMA Channels	6
SPI TM	6
I ² C TM Compatible	6
Peripheral Pin Select (PPS)	Yes
Crossbar	
Number of CAN modules	2
Type of CAN module	CAN-FD
A/D channels	12
Max A/D Resolution	12
Max A/D Sample Rate (KSPS)	1000
Input Capture	10
Output Compare/Std. PWM	10
Motor Control PWM Channels	14
16-bit Digital Timers	5
Parallel Port	GPIO
Comparators	4
Internal Oscillator	32khz, 32Khz ULP, 48Mhz
RTCC	Yes
I/O Pins	38
Pin Count	48
Quadrature Encoder Interface (QEI)	1

CAN Interface

The SAMC21G18A provides two integrated CAN controllers, which provide communication according to ISO 11898-1 (Bosch CAN specification 2.0 part A,B) and to Bosch CAN FD specification V1.0. The on-chip CAN controllers are supplemented by two ATA6561 CAN transceivers, which are fully ISO 11898-2,-5, SAE J2284 compliant and CAN FD ready. For detailed information about the CAN transceiver (data sheet, application notes, quickstart guides), see the following link:

<http://www.microchip.com/wwwproducts/en/ATA6561>

Clock Options

The SAMC21G18A microcontroller provides a flexible clock system for clocking the CPU core and the peripherals. Beside several internal RC oscillators, two external clock options can be used and are already mounted on the SammyC21 module. First one is a 16MHz crystal, which can be used to clock the internal PLL system and the consecutive clock generators. The second one is a 32768Hz watch crystal as precise clock source for the internal realtime clock (RTC) timer. See SAMC21G18A data sheet for further information.

Status LED

As simple yet effective status indicator, a low-power LED is onboard and connected to pin PA28 of the ATSAMC21G18A microcontroller. Driving this pin to high will turn on the LED.

Power Supply

The Sammy-C21 module operates from 4.5V to 5.5V through VCC pin or from USB bus power (see „Configuration Jumpers“ for details). This voltage directly powers the CAN side of the on-board CAN bus transceivers. The remaining parts of the module are powered with 3.3V from the on-board LDO, hence all external GPIO signals operate on 3.3V levels. The 3.3V voltage from the LDO is also available at the V33 pin and can be used to supply external circuitry connected to the Sammy-C21. If using this, always keep the maximum current as well as (even more important!) the maximum power dissipation of the LDO in mind. The LDO provides a maximum of 600mA output current, but when you plan to e.g. use the module up to 70°C environment temperature, the maximum power dissipation drops to approx. 430mW, thus limiting the output current to approx. 250mA when operated at stable 5V VCC. Ask us, if you are unsure about your planned configuration.

Note 1: The LDO could in principle operate on a VCC voltage from ~3.7V to 6.0V to generate a proper 3.3V output voltage, but since the CAN bus transceivers are operated from VCC directly, its power supply voltage range applies to the whole module.

Note 2: Since the ATSAMC21G18A allows 5V operation also, it is possible to operate the whole module at 5V by removing the on-board 3.3V LDO. This is useful for 5V-only applications with external 5V circuitry. Ask us in advance, if you want to purchase a 5V only module version. In that case 5V have to be connected external to both VCC and V33 pins.

Bootloader Support

We will soon provide the module with preloaded chip45boot3 bootloader and free PC GUI for uploading firmware through USB. This is great for a low-cost start into SmartARM module based applications, since it avoids the need to purchase an additional programming/debugging device. It's also convenient for series production, because it allows the end-customer to update firmware in case of bug fixes.

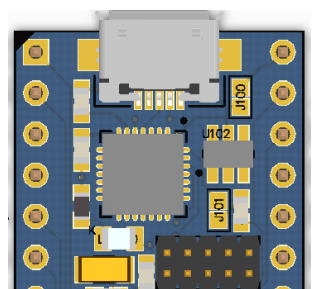
Configuration Jumpers

The Sammy-C21 module provides two configuration jumpers, which are carried out as solder-bridges and need to be closed by a small dot of solder.

J100: Close this jumper to power the on-board LDO from USB bus power.

J101: Close this jumper to enable bootloader auto-reset feature.

See picture right for location of the two jumpers.



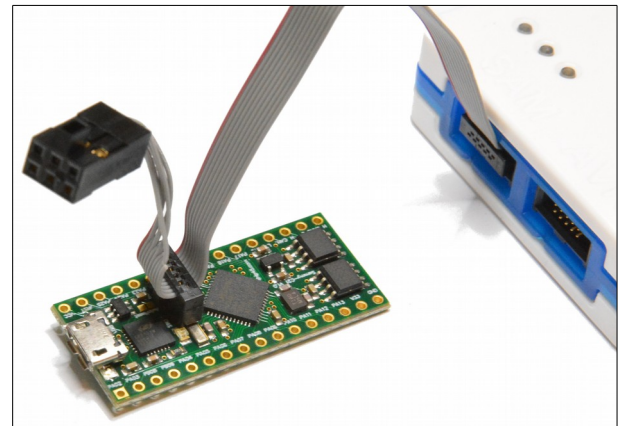
Programming and Debugging

The Sammy-C21 module provides a standard 10-pin Cortex SWD program and debug connector, which directly connects to many programmers and debuggers. Atmel/Microchip provides the ATMEL-ICE programmer/debugger in different configurations in terms of packaging with adapter cables (see <http://www.atmel.com/tools/atmel-ice.aspx>). For programming and debugging the Sammy-C21 module, the ATMEL-ICE-BASIC is sufficient (providing a standard 10-pin SWD cable plus 6-pin ISP connector for e.g. Atmel/Microchip ATmega, ATtiny, Xmega, etc. devices).

See picture right for proper connection of the ATMEL-ICE SWD cable to the Sammy-C21 module.

The ATMEL-ICE is available in our online shop:

[sam_arm_cortex_avr_atmega_xmega_swd_isp_pdi_jtag_programmer_debugger.php](http://www.chip45.com/sam_arm_cortex_avr_atmega_xmega_swd_isp_pdi_jtag_programmer_debugger.php)



Software Development

Atmel Studio 7

Atmel Studio 7 is the integrated development platform (IDP) for developing and debugging all AVR® and SAM microcontroller applications. The Atmel Studio 7 IDP gives you a seamless and easy-to-use environment to write, build and debug your applications written in C/C++ or assembly code. It also connects seamlessly to the debuggers, programmers and development kits that support AVR and SAM devices.

Additionally, Studio includes Atmel Gallery, an online app store that allows you to extend your development environment with plug-ins developed by Microchip as well as third-party tool and embedded software vendors. Studio 7 can also seamlessly import your Arduino sketches as C++ projects, providing a simple transition path from Makerspace to Marketplace.



See <http://www.microchip.com/development-tools/atmel-studio-7> for details and free download.

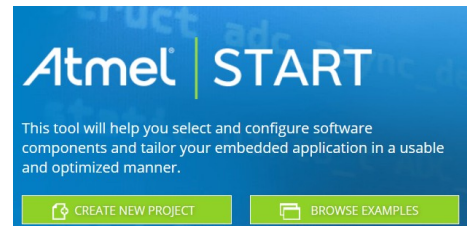
Features

- Support for 500+ AVR and SAM devices
- Vast source code library, including drivers, communication stacks, 1,600+ project examples with source code, graphic services and touch functionality through Advanced Software Framework (ASF)
- IDE extensions through Atmel Gallery, the online apps store, for development tools and embedded software from Microchip and third parties
- Tune capacitive touch designs, validate system performance, monitor power consumption, and real-time data and trace graphing with Atmel QTouch Composer
- Configure and test the performance of wireless designs with the Wireless Composer running on the target
- Write and debug C/C++ and assembly code with the integrated compiler
- Advanced debugging features include complex data breakpoints, nonintrusive trace support (SAM3 and SAM4 devices), statistical code profiling, interrupt trace/monitoring, polled data tracing (Cortex-M0+ devices), real-time variable tracking with optional timestamping.
- Integrated editor with visual assist
- Project wizard allowing projects created from scratch or from a large library of design examples
- In-system programming and debugging provides interface to all Atmel in-circuit programmers and debuggers
- Create transparent debug views into CPU and peripherals for easy code development and debugging
- Full chip simulation for an accurate model of CPU, interrupts, peripherals, and external stimuli

Atmel START

Another starting point for Atmel SAM software development is Atmel START - an online tool, which will help you select and configure software components and tailor your embedded application in a usable and optimized manner.

To get started you can either create a new project from scratch or open an existing example. In both cases you can configure your software components and device settings such as clocks and pin layout. When you are done, you can export your project and open it using your favourite IDE for further development.



For more informations and video tutorials, see <http://start.atmel.com/>.

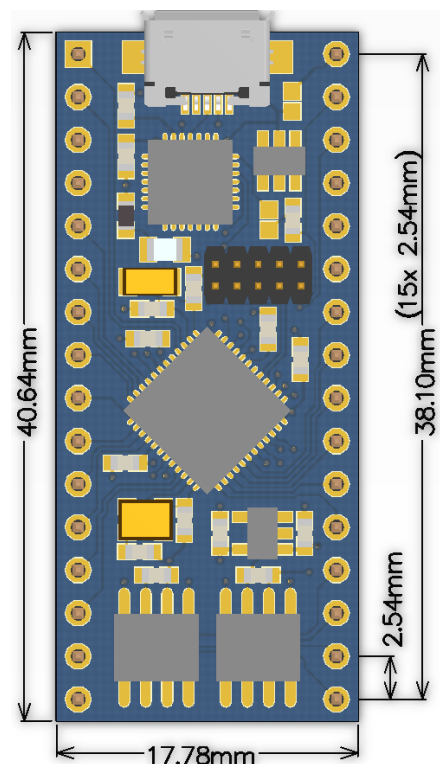
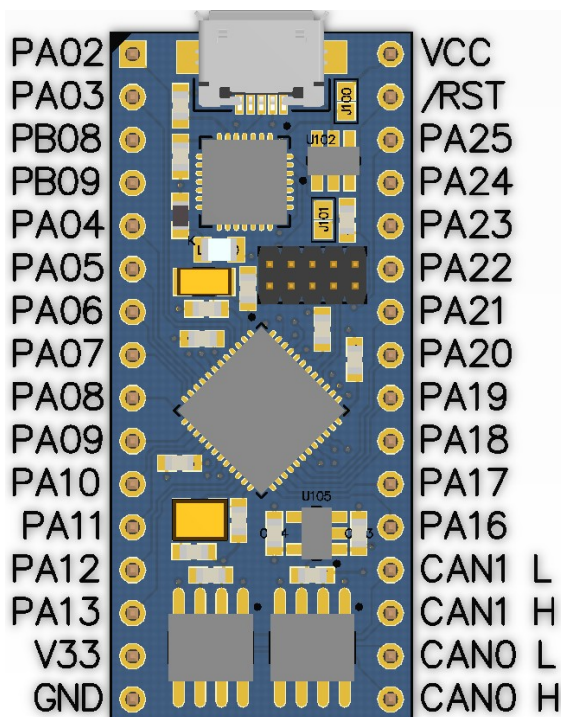
Operating Characteristics

The following table shows the main characteristics for reference. Always refer to the components data sheets for detailed description of electrical and thermal characteristics.

Symbol	Parameter	Condition	Min	Typ	Max	Units
Vcc	External Supply Voltage		4.5	5.0	5.5	V
V33	Internal Supply Voltage			3.3		V
Icc	Power Supply Current (Icc strongly depends on MCU activity, like frequency, power saving modes, etc. as well as external circuitry, io pin input and output current, etc. The values denoted here are for reference only and can differ from final application vallues.	MCU ACTIVE	3.4	5.0	5.4	mA
		MCU IDLE		1.8		mA
		add per used CAN bus:				
		CAN bus active (recessive state)	2		5	mA
		CAN bus active (dominant state)	20	50	70	mA
T	Operating Temperature		-40		+85	°C

Pinout and Dimensions

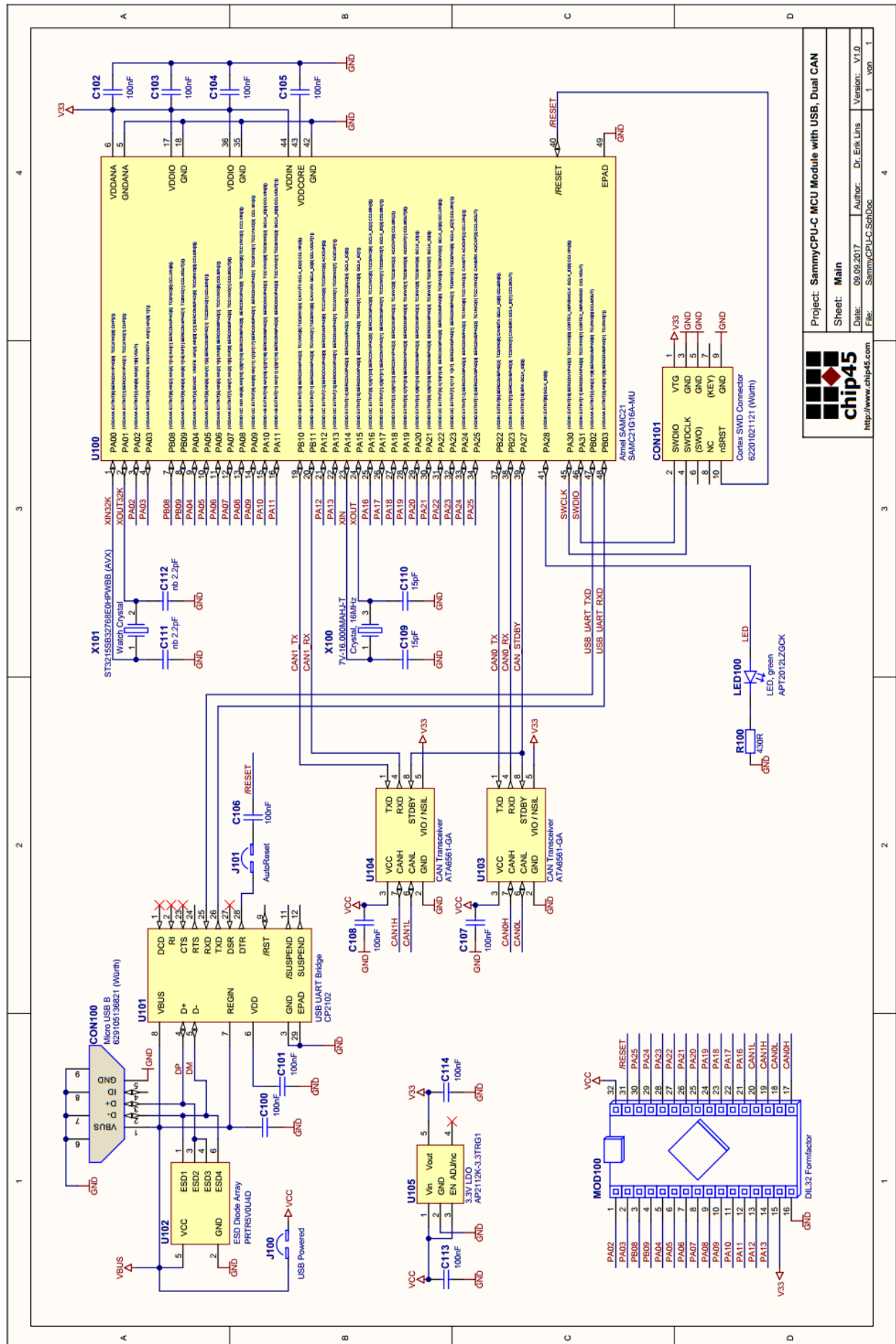
Check ATSAMC21G18A data sheet for mapping of the MCU peripherals to GPIO signals.



Design and Handling Precautions

This module – just like any other semiconductor devices – is susceptible to damage by ESD. Suitable precautions should be taken when handling and transporting devices. The possible damage to devices depends on the circumstances of the handling and transporting, and the nature of the device. The extent of damage can vary from immediate functional or parametric malfunction to degradation of function or performance in use over time. Devices suspected of being affected should be replaced.

Better Embedded.



Declaration of Electro Magnetic Conformity of the CHIP45 „Sammy-C21“

CHIP45 embedded microcontroller modules (henceforce products) are designed for installation in electrical appliances or as dedicated evaluation boards (i.e.: for use as a test and prototype platform for hardware/software development) in laboratory environments.



Caution:

CHIP45 products lacking protective enclosures are subject to damage by ESD and, hence, may only be unpacked, handled or operated in environments in which sufficient precautionary measures have been taken in respect to ESD-dangers. It is also necessary that only appropriately trained personnel (such as electricians, technicians and engineers) handle and/or operate these products. Moreover, CHIP45 products should not be operated without protection circuitry if connections to the product's pin header rows are longer than 3m.

CHIP45 products fulfill the norms of European Union's Directive for Electro Magnetic Conformity only in accordance to the descriptions and rules of usage indicated in this document (particularly in respect to the pin header row connectors, power connector and serial interface to a host-PC).

Implementation of CHIP45 products into target devices, as well as user modifications and extensions of CHIP45 products, is subject to renewed establishment of conformity to, and certification of, Electro Magnetic Directives. Users should ensure conformance following any modifications to the products as well as implementation of the products into target systems.

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