

**OEM module with USB, RS485, SD-Card based on Atmel's AVR ATxmega128A3U processor.**

## AVAILABLE PROCESSOR OPTIONS

Module	Processor	RAM	EEPROM	Flash	Peripherals
CrumbX128A3 V1.5	ATxmega128A3U	8kB SRAM	2kB EEPROM	128kB Flash +8kB Bootblock	- CP2102 USB-UART converter - mini USB B 5pin connector - MAX3362 3.3V RS485 transceiver - status LED and tiny reset button

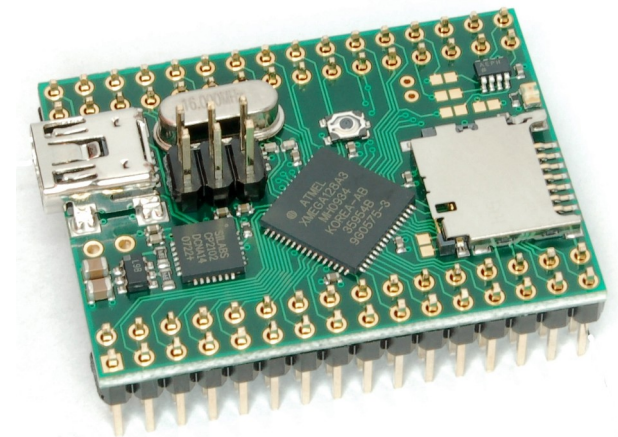
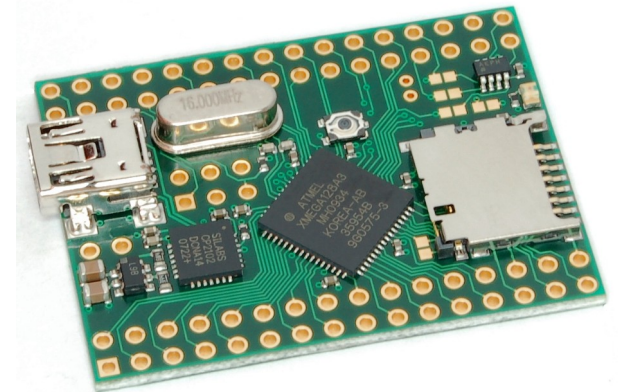
## VOLTAGE REGULATOR

A 3.3V LDO voltage regulator NCP500 is integrated on the module, thus providing two options for supplying power to the onboard components:

- 1) Connect up to 6V to Vin pin, which is the input of the voltage regulator. The onboard components are now powered from the regulator at 3.3V.
- 2) Bypass the voltage regulator and directly connect external 3.3V to one of the the VCC pins. The voltage regulator is in shutdown mode now and the onboard components are powered from the external 3.3V supply voltage.

The LDO voltage regulator can supply up to 200mA, depending on power dissipation and input voltage. Please see the data sheet for details.

*Note: The maximum input voltage Vin is different to the previous version V1.2, which was up to 12V. Make sure to supply the module with 6V maximum externally at Vin!*



## USB USART INTERFACE

A USB UART converter CP2102 by Silabs is connected to the MCU's USART0 on PORTF. A standard 5pin mini USB B connector is available onboard and allows for easy connection to a host PC. The CP2102 is always powered from USB bus. By closing jumper J1, USB bus power is connected to Vin of the module (i.e. before the 3.3V voltage regulator, see above), allowing for USB powered applications. If you add external components in that case, make sure to stay within the allowed current consumption for USB powered devices (100mA/500mA) and maximum power dissipation of the voltage regulator!

## XMEGA USB CONTROLLER

The new ATxmega128A3U provides an onchip USB controller (see ATxmega128U datasheet for detailed information). The USB signals are located on Xmega port pins PD6 (D-) and PD7 (D+) and can be used externally for USB.

A suitable USB software framework for almost all AVR devices with USB controller can be found at: <http://www.fourwalledcubicle.com/LUFA.php>

## RS485 INTERFACE

The module comes with a MAX3362 3.3V RS485 transceiver onboard. It is connected to the MCU's USART0 on PORTE as well as PE1 to control the transceiver transmit or receive mode. Four jumpers J2 to J5 are used to disconnect the signals plus the transceiver's VCC from the MCU to fully disable the RS485 transceiver and allow for other usage of the USART signals. The four jumpers are open by default, thus disabling RS485. If you want to use RS485, close all four jumpers!

## SD-CARD INTERFACE

The module comes with a micro SD-card header / slot. The SD-card signals are connected to the MCU's SPI interface on PORTE (PE5, PE6, PE7), plus a chip select signal on PE4. The SD-card header provides a card detect signal of the micro SD-card inserted. If you want to use this, close jumper J6 and the card detect signal is available on PE0 of the MCU. Don't forget to enable PE0's internal pull up resistor!

*Note: The connection of the sd-card interface is different to the previous version V1.2 of the CrumbX128A3! Please take this into account when using code from the previous version on the new V1.5 version of the module!*

## PREINSTALLED BOOTLOADER

The module can be shipped with the latest version of the chip45boot2 bootloader preprogrammed. It allows for flash and eeprom programming over USB without the need for an ISP adapter. The bootloader is being enabled by a certain character sequence after reset, then automatically adjusts it's baudrate to the host PC's baudrate and shows a command prompt and is ready to work. See <http://go.chip45.com/c45b2> for details on the chip45boot2 bootloader. If the preloaded bootloader is desired, please contact us in advance.

## AUTO RESET FEATURE

To support later usage of the chip45boot2 bootloader and since this bootloader is enabled by USB USART communication after reset, it is possible to automatically reset the module in the moment the virtual COM port on the host PC side is being opened by the bootloader PC application or by a terminal program. This is possible by closing jumper J7, which connects the CP2102's DTR signal through a capacitor to the MCU's reset signal. DTR goes low when the virtual COM port is opened and the capacitor forwards this low as a pulse to reset. This is a comfortable way of working with the module and the bootloader without the need for manually resetting the device for hex file upload!

## SYSTEM CLOCK OPTIONS

The module does not come with a crystal preinstalled. A suitable crystal is included with the module and it's frequency is selectable as option in the online shop. You can select from either different XTAL crystals or a 32kHz watch crystal. See picture below for proper location of the crystals before soldering them.

## RESET BUTTON

A tiny reset button is available to force a manual reset of the MCU. A 10kOhm pullup resistor is connected to the MCU's reset signal to make it less susceptible to EMI, than with just the MCU-internal pullup resistor.

## STATUS LED

A green low-current status LED is connected low-active to the MCU's signal PD0. Setting this pin to output and low will turn on the LED.

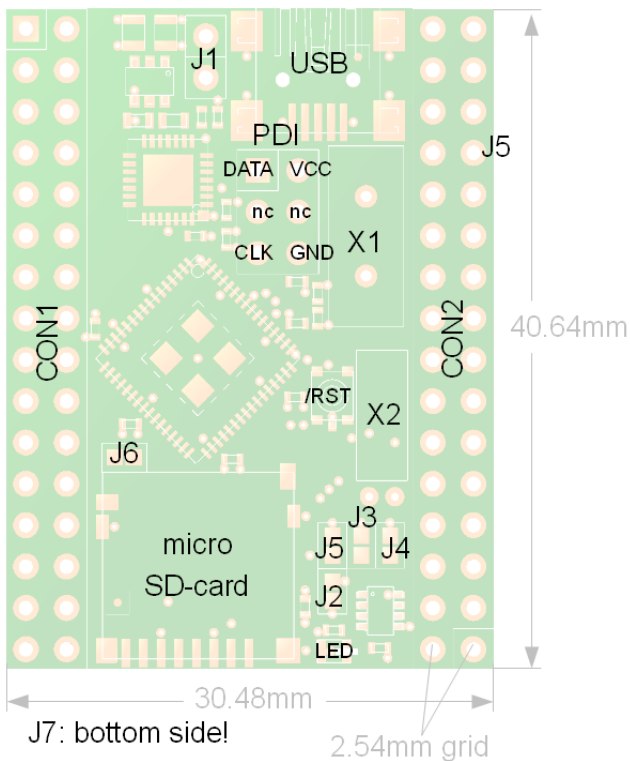
## PDI CONNECTOR

A PDI header with Atmel's standard 6-pin pinout is available on the module, see pictures below for location and pinout. ISP adapters, like AVRISP-mkII or JTAGICE-mkII can be connected directly.

## EXPANSION CONNECTORS

All MCU signals are available on the two expansion connector on the long sides. Also the USB bus signals as well as the RS485 signals are present here. All VCC/GND pins are connected internally.

## PIN CONFIGURATION AND DIMENSIONS



Vin	PA0	USB_VBUS	USB_D-
PA1	PA2	USB_D+	GND
PA3	PA4	PDA_DATA	VCC
PA5	PA6	PDI_CLK	GND
PA7	PB0	PR1	PR0
PB1	PB2	GND	PF7
PB3	PB4	PF6	PF5
PB5	PB6	PF4	PF3
PB7	PC0	PF2	PF1
PC1	PC2	PF0	PE7
PC3	PC4	PE6	PE5
PC5	PC6	PE4	PE3
PC7	PD0	PE2	PE1
PD1	PD2	PE0	PD7
PD3	PD4	PD6	GND
PD5	GND	RS485_B	RS485_A

## DESIGN AND HANDLING GUIDELINES

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.

## OPERATING CHARACTERISTICS

Symbol	Parameter	Condition	Min	Typ	Max	Units
Vin	External Supply Voltage		3.5		6	V
Vcc	Supply Voltage	0-12 MHz	1.6		3.6	V
		0-32 MHz	2.7		3.6	V
		RS485 used		3.3 +/-5%		V
Icc	Power Supply Current <small>(Icc strongly depends on CPU 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 values. The values for RS485 depend on bus termination resistance and can vary from the listed values.)</small>	Active 2MHz Vcc = 3V		1.4		mA
		Active 32MHz Vcc = 3V		16		mA
		USB bus active		+20		mA
		RS485		+1.7		mA
T	Operating Temperature <small>(industrial temperature range on request)</small>		-20		+70	°C

## SCOPE OF DELIVERY

This module is being shipped without pin headers (THT components) preinstalled. A Connector Kit with standard pin headers and receptacles can be ordered as option.

## DEVELOPMENT TOOLS

The free WinAVR C/C++ compiler toolset provides a powerful and stable development environment, which is nicely integrated into Atmel's AVR-Studio development suite. Please visit the following pages for more details:

- Atmel AVR Studio: [http://www.atmel.com/dyn/products/tools\\_card.asp?tool\\_id=2725&category\\_id=163&family\\_id=607&subfamily\\_id=760](http://www.atmel.com/dyn/products/tools_card.asp?tool_id=2725&category_id=163&family_id=607&subfamily_id=760)
- AVR GNU Toolchain for Windows: [http://www.atmel.com/dyn/products/tools\\_card.asp?tool\\_id=4118&category\\_id=163&family\\_id=607&subfamily\\_id=760](http://www.atmel.com/dyn/products/tools_card.asp?tool_id=4118&category_id=163&family_id=607&subfamily_id=760)
- AVR GNU Toolchain for Linux: [http://www.atmel.com/dyn/products/tools\\_card.asp?tool\\_id=17311&category\\_id=163&family\\_id=607&subfamily\\_id=760](http://www.atmel.com/dyn/products/tools_card.asp?tool_id=17311&category_id=163&family_id=607&subfamily_id=760)

## WHAT ELSE DO YOU NEED?

- To use the bootloader comfortably from a Windows PC application, see [www.chip45.com/info/chip45boot2.html](http://www.chip45.com/info/chip45boot2.html) for the latest version of the chip45boot2 GUI application.
- If you prefer ISP programming, you need an ISP adapter for in-system programming of the MCU, see [www.chip45.com/AVR-ISP-Programmer-Adapter](http://www.chip45.com/AVR-ISP-Programmer-Adapter) for suitable devices.
- If you need source level debugging, you should consider Atmel's JTAGICE-mkII debugger (which is available here: [www.chip45.de/AVR-ISP-Programmer-Adapter](http://www.chip45.de/AVR-ISP-Programmer-Adapter)).
- Windows and Mac users need the latest USB driver for the CP2102 USB UART converter (see CP2102 homepage at <https://www.silabs.com/products/interface/usbtouart/Pages/default.aspx>)
- A development environment and compiler/assembler (see above DEVELOPMENT TOOLS)

## Declaration of Electro Magnetic Conformity of the CHIP45 „CrumbX128A3 V1.5“



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.

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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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