

*OEM module with USB, RS485, SD-Card based on Atmel's AVR ATxmega128A1 processor.*

## AVAILABLE PROCESSOR OPTIONS

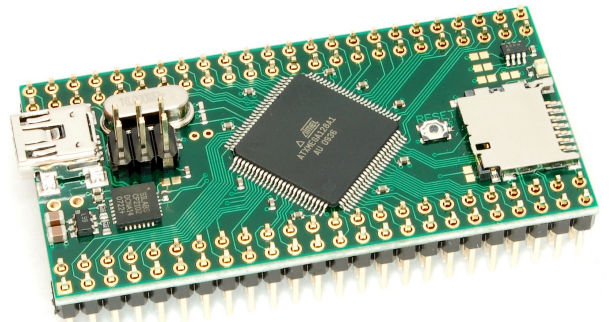
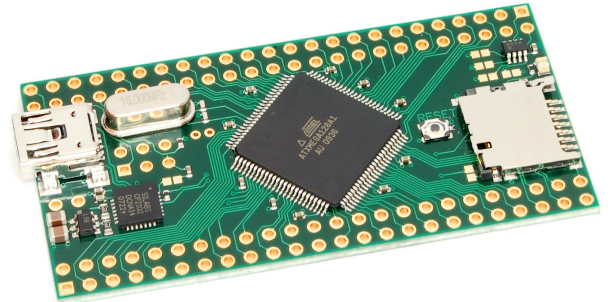
Module	Processor	RAM	EEPROM	Flash	Peripherals
CrumbX128A1 V1.0	ATxmega128A1	8kB SRAM	2kB EEPROM	128kB Flash	- CP2102 USB-UART converter - mini USB B 5pin connector - MAX3362 3.3V RS485 transceiver - status LED and tiny reset button

## VOLTAGE REGULATOR

A 3.3V LDO voltage regulator ADP3331 is integrated on the module, thus providing two options for supplying power to the onboard components:

- 1) Connect up to 12V 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 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.



## USB 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!

## 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 PORTD (PD5, PD6, PD7), plus a chip select signal on PD4. The SD-card header provides a write protect status signal of the micro SD-card inserted. If you want to use this, close jumper J6 and the write protect signal is available on PD1 of the MCU. Don't forget to enable PD1's internal pull up resistor!

## 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 its 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.

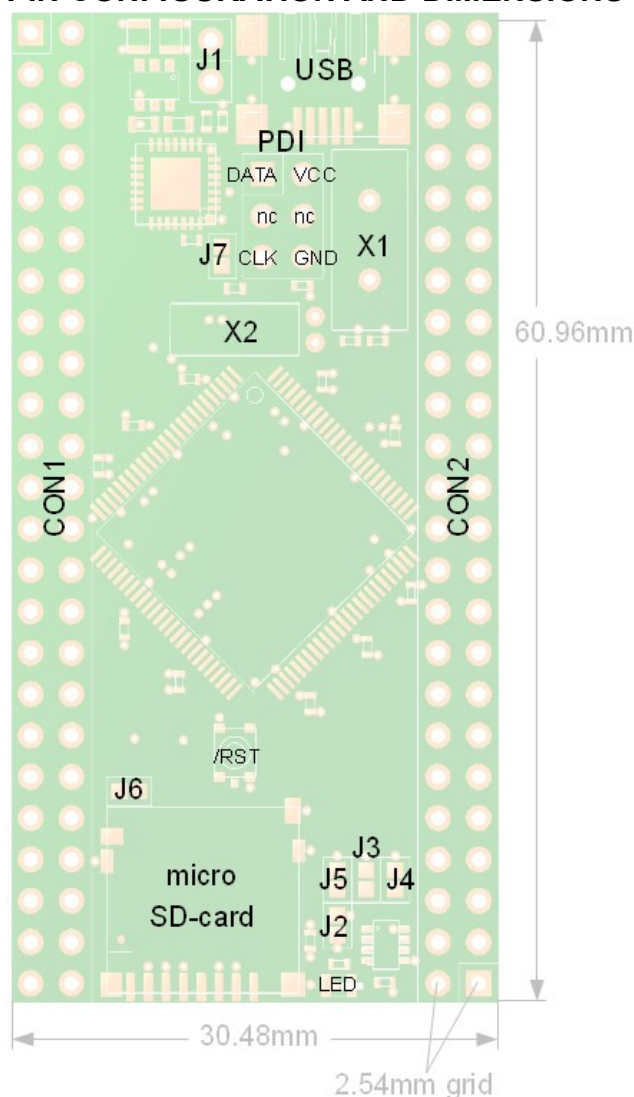
## PDI CONNECTOR

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	GND	USB_VBUS	USB_D-
PA0	PA1	USB_D+	GND
PA2	PA3	PDI_DATA	VCC
PA4	PA5	PDI_CLK	GND
PA6	PA7	PR1	PR0
PB0	PB1	GND	nc
PB2	PB3	PQ3	PQ2
PB4	PB5	PQ1	PQ0
PB6	PB7	PK7	PK6
PC0	PC1	PK5	PK4
PC2	PC3	PK3	PK2
PC4	PC5	PK1	PK0
PC6	PC7	PJ7	PJ6
PD0	PD1	PJ5	PJ4
PD2	PD3	PJ3	PJ2
PD4	PD5	PJ1	PJ0
PD6	PD7	PH7	PH6
PE0	PE1	PH5	PH4
PE2	PE3	PH3	PH2
PE4	PE5	PH1	PH0
PE6	PE7	PF7	PF6
PF0	PF1	PF5	PF4
PF2	PF3	VCC	GND
VCC	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				12	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  (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 vallues. The values for RS485 depend on bus termination resitance and can vary from the listed values.)	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 (industrial temperature range on request)		-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](http://www.atmel.com/dyn/products/tools_card.asp?tool_id=2725)
- WinAVR compiler toolset: <http://winavr.sourceforge.net/>

## 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 „CrumbX128A1 V1.0“



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.

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