

**OEM module with USB and RS232/485 for rapid application development based on Atmel AVR MCUs.**

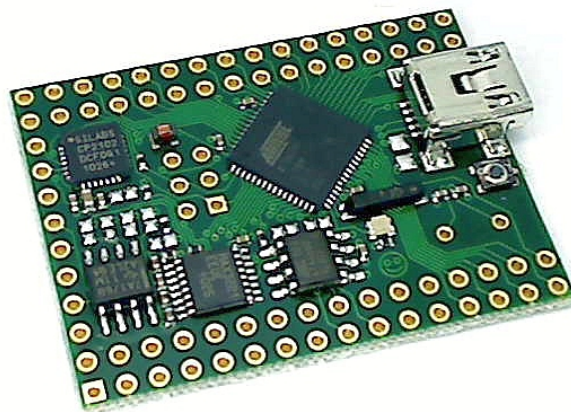
## AVAILABLE PROCESSOR OPTIONS

Module	Processor	RAM	EEPROM	Flash	Peripherals
Crumb128 V5.0 with RS232	ATmega128	4kB SRAM	4kB EEPROM	128kB Flash	<ul style="list-style-type: none"><li>- CP2102 USB-UART converter</li><li>- mini USB B 5pin connector</li><li>- MAX3221 RS232 transceiver</li><li>- status LED and tiny reset button</li></ul>
Crumb128-CAN V5.0 with RS232	AT90CAN128	4kB SRAM	4kB EEPROM	128kB Flash	<ul style="list-style-type: none"><li>- CP2102 USB-UART converter</li><li>- mini USB B 5pin connector</li><li>- MAX3221 RS232 transceiver</li><li>- ISO 11898-24V standard CAN transceiver</li><li>- status LED and tiny reset button</li></ul>
Crumb128-CAN V5.1 (*) with RS485	AT90CAN128	4kB SRAM	4kB EEPROM	128kB Flash	<ul style="list-style-type: none"><li>- CP2102 USB-UART converter</li><li>- mini USB B 5pin connector</li><li>- SN75ALS176 RS485 transceiver</li><li>- ISO 11898-24V standard CAN transceiver</li><li>- status LED and tiny reset button</li></ul>

(\*) The Crumb128-CAN V5.1 is an assembly variant of Crumb128-CAN V5.0 and uses the same PCB board, hence both variants are labeled „V5.0“ on the bottom side copper. If you are unsure, you can check the presence of the SO-8 RS485 transceiver on the top side in the low left corner (see picture below).

## USB INTERFACE

A USB UART converter CP2102 by Silabs is connected to the MCU's first USART RXD0/PE0 and TXD0/PE1. 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 J6, USB bus power is connected to VCC of the module, 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)!



## RS232 INTERFACE

The module comes with a MAX3221 RS232 transceiver onboard. It is connected to the MCU's second USART RXD1/PD2 and TXD1/PD3. The device is disabled by default and can be enabled by closing jumper J7 (RS232 Enable).

The MAX3221 provides an Auto Shutdown feature, which is enable by default. If the device doesn't detect a valid RS232 level at its RX input, it remains in shutdown and disables the internal charge pumps. Since this can be a problem in systems, where the RS232 sender also has some Auto Shutdown circuitry and none of the transceivers will leave shutdown, it can be disabled by closing jumper J9.

## CAN INTERFACE

In case the module is equipped with the AT90CAN128 MCU, also a ISO 11898-24V standard compatible CAN transceiver is assembled, thus allowing for direct connection to a CAN bus without external components. The transceiver provides a slope resistor input to limit slew rate of the CAN signals. This signal is available on the expansion headers and can be connected externally to either high (standby) or low (high speed) or a MCU pin (to select mode in software) or to a resistor for slope control. If not desired, you can also close jumper J8 to enable HighSpeed CAN without slope control.

## 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

Since the module comes with the chip45boot2 bootloader preloaded and 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 J5, 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!

## 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 PB7. Setting this pin to output and low will turn on the LED.

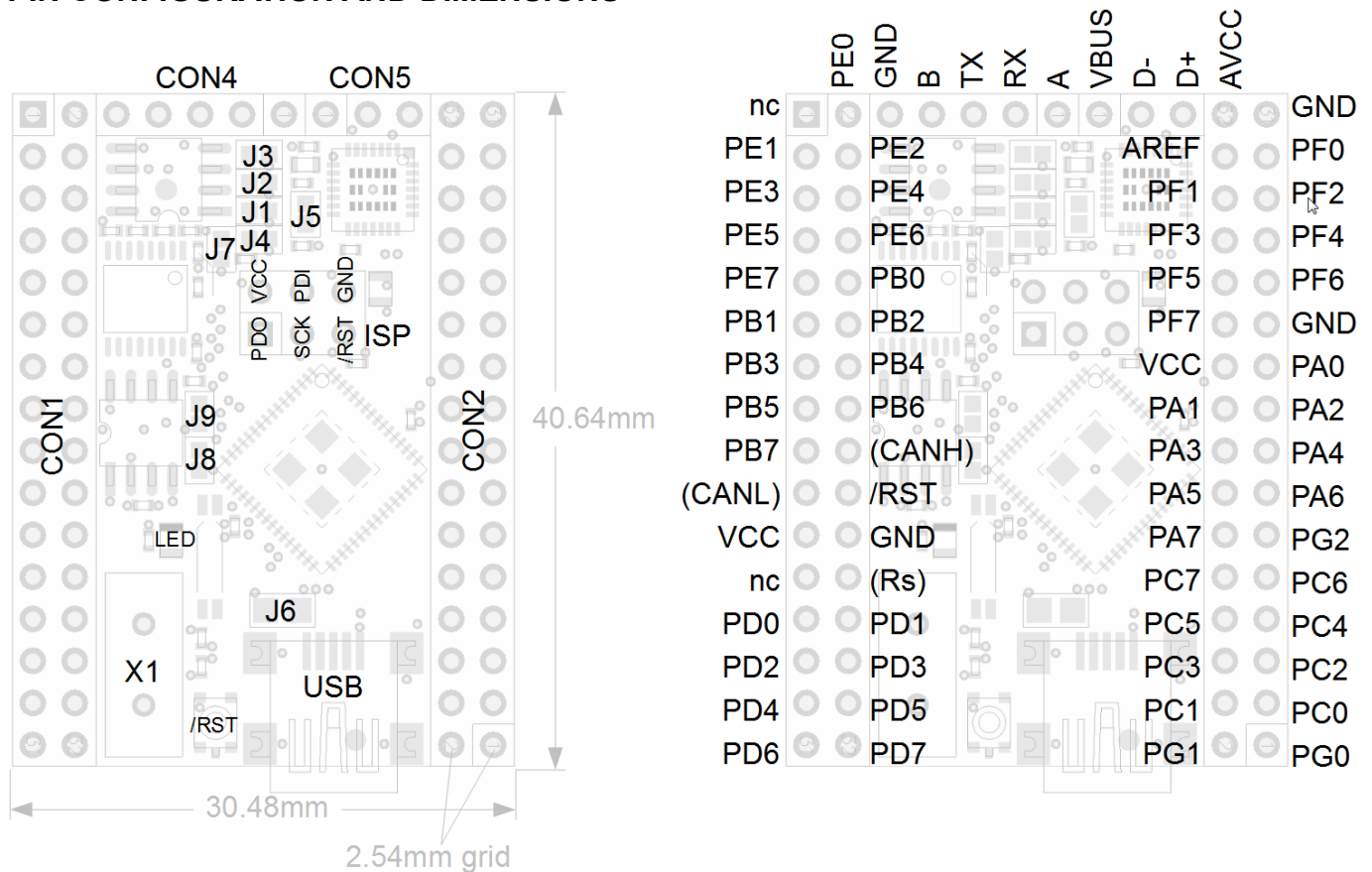
## ISP CONNECTOR

An ISP header with Atmel's standard 6-pin pinout is available on the module, see pictures below for location and pinout.

## EXPANSION CONNECTORS

Two 32 pin headers provide all free MCU signals, as well as the optional CAN signals. RS485 and USB signals are available on a third 8 pin connector. See the following pictures for details.

## PIN CONFIGURATION AND DIMENSIONS



## 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
Vcc	Supply Voltage	0-8 MHz	2.7		5.5	V
		0-16 MHz	4.5		5.5	V
		RS485 used	4.5		5.5	V
		CAN used	4.5		5.5	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 values. The values for RS485 or CAN bus usage depend on bus termination resistance and can vary from the listed values.)	Active 8MHz Vcc = 3V		16		mA
		Active 16MHz Vcc = 5V		30		mA
		USB bus active		+20		mA
		RS485		+30		
		CAN bus dominant			+85	mA
		CAN bus recessive			10	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 4.18 (build 684): [http://www.atmel.com/forms/software\\_download.asp?category\\_id=163&family\\_id=607&subfamily\\_id=760&fn=dl\\_AvrStudio4Setup.exe](http://www.atmel.com/forms/software_download.asp?category_id=163&family_id=607&subfamily_id=760&fn=dl_AvrStudio4Setup.exe)
- Atmel AVR Studio Service Pack 1 (build 692):  
[http://www.atmel.com/dyn/resources/prod\\_documents/AVRStudio4.18SP1.exe](http://www.atmel.com/dyn/resources/prod_documents/AVRStudio4.18SP1.exe)
- Atmel AVR Studio Service Pack 3 (build 716):  
[http://www.atmel.com/dyn/resources/prod\\_documents/AVRStudio4.18SP3.exe](http://www.atmel.com/dyn/resources/prod_documents/AVRStudio4.18SP3.exe)
- Atmel AVR Toolchain Installer: [http://www.atmel.com/forms/software\\_download.asp?category\\_id=163&family\\_id=607&subfamily\\_id=760&fn=dl\\_avr-toolchain-installer-3.2.3.579-win32.win32.x86.exe](http://www.atmel.com/forms/software_download.asp?category_id=163&family_id=607&subfamily_id=760&fn=dl_avr-toolchain-installer-3.2.3.579-win32.win32.x86.exe)

**Note: Make sure to install both service pack 1 and service pack 3 for AVR Studio 4!**

Always check

[http://www.atmel.com/dyn/products/tools.asp?category\\_id=163&family\\_id=607&subfamily\\_id=760](http://www.atmel.com/dyn/products/tools.asp?category_id=163&family_id=607&subfamily_id=760)  
for the latest version of AVR Studio or the AVR toolchain.

## 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/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx>)
- A development environment and compiler/assembler (see above DEVELOPMENT TOOLS)

## Declaration of Electro Magnetic Conformity of the CHIP45 „Crumb128 V5.0“, “Crumb128-CAN V5.0”, “Crumb128-CAN V5.1”



CHIP45 embedded microcontroller modules (henceforth 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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