

## MMmega0X Minimodules for ATmega 103/128

# User's guide

REV 1.2

**PEPOX**<sup>®</sup>  
Many ideas one solution

## Introduction

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MMmega01 and MMmega02 are universal minimodules for the ATmega 103/128 microcontrollers from Atmel. This microcontroller is available in the TQFP64 case which is difficult to apply to prototype and amateur circuits due to the compactness of pins. We have undertaken an attempt at placing it on a board of 39x42 mm with a layout of leads which matches the commonly available prototype circuit boards. In addition, we have included a real-time clock with battery back-up, a serial DataFlash memory with a capacity of up to 4 Mb, a circuit monitoring the supply voltage and an ISP (In-System Programming) connector. All ports and signals of the microcontroller are lead out by means of two-row pin connectors with 0.1' pitch. This minimodule is not only an adapter but a complete main board for ATmega 103/128. It needs only a connection to the supply voltage and to the ISP connector and we can start loading 128 kbytes of flash memory of the microcontroller. Through integration of the peripherals with the microcontrollers on one board, the application of this module can lead to a shorter design period and facilitate the construction of systems based on ATmega microcontrollers, by eliminating the need to design the printed board. The module is supplied with software for communication with the in-built peripherals.

## Features of the modules

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- Microcontroller ATmega 103/128 (L)<sup>(1)</sup>
- Real-time clock with I<sup>2</sup>C or SPI + socket for a CR2032 lithium battery <sup>(1)</sup>
- Serial DataFlash memory with SPI bus with a capacity of up to 4 Mb <sup>(1)</sup>
- Connector for programming in the SPI system with bus multiplexer
- A circuit resetting and controlling the supply voltage (DS1811 or DS1817) <sup>(1)</sup>
- All ports and signals of the microcontroller are led to pin terminals with 0.1" pitch on both sides of the board
- A additional 32.768 kHz quartz crystal for the internal timer/counter of the microcontroller <sup>(1)</sup>
- Small dimensions
- Exemplary software in the form of a function of C language

Note:

1: depending on minimodule version

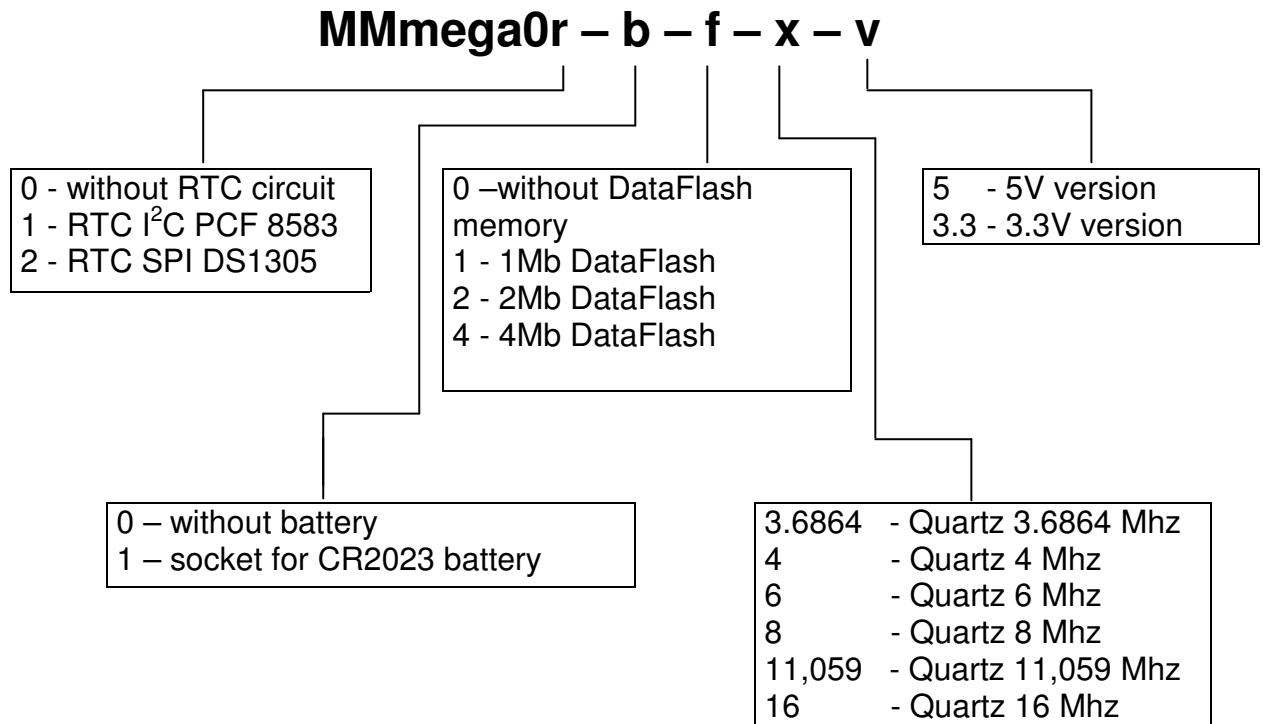
## Available versions

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The circuit is available in three basic versions:

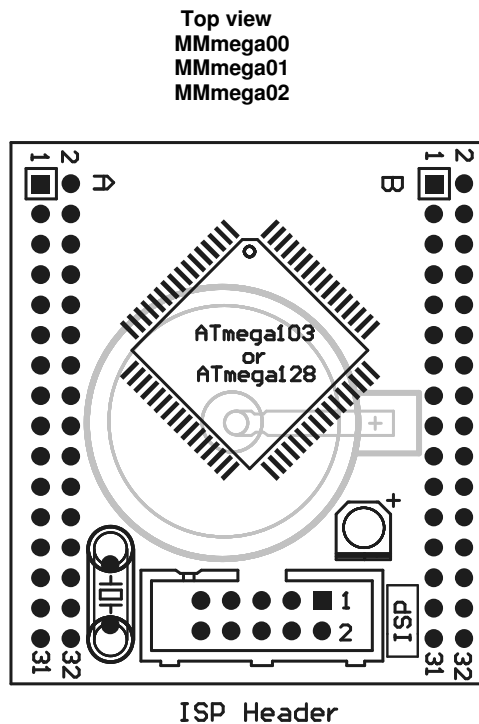
- **MMmega00** - ATmega 128, 14.7456 MHz, quartz crystal 32.768 kHz
- **Mmega01** - ATmega128, 14.7456 MHz, DataFlash 1 Mb, RTC I<sup>2</sup>C PCF8583, lithium battery socket, quartz crystal 32.768 kHz, supply voltage 5 V DC
- **MMmega02** - ATmega128, 14.7456 MHz, DataFlash 1 Mb, RTC SPI DS1305, lithium battery socket, quartz crystal 32.768 kHz, supply voltage 5 V DC

An own configuration is also possible according to the following selector:



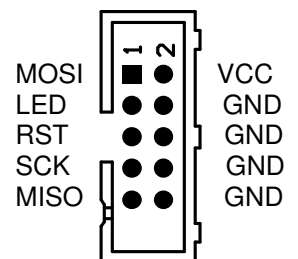
## Description of terminals

A1	PE0 (Rx/D)
A2	PE1 (Tx/D)
A3	PE2 (AC+)
A4	PE3 (AC-)
A5	PE4 (INT4)
A6	PE5 (INT5)
A7	PE6 (INT6)
A8	PE7 (INT7)
A9	PB0 (SS)
A10	PB1 (SCK)
A11	PB2 (MOSI)
A12	PB3 (MISO)
A13	PB4 (OC0)
A14	PB5 (OC1A)
A15	PB6 (OC1B)
A16	PB7 (OC2)
A17	PD0 (INT0)
A18	PD1 (INT1)
A19	PD2 (INT3)
A20	PD3 (INT4)
A21	PD4 (IC1)
A22	PD5
A23	PD6 (T1)
A24	PD7 (T2)
A25	XTAL-Out
A26	RST
A27	/RD
A28	/WR
A29	PG3
A30	PG4
A31	GND
A32	VCC



B1	/PEN
B2	VBAT
B3	AVCC
B4	AGND
B5	AREF
B6	PF0 (ADC0)
B7	PF1 (ADC1)
B8	PF2 (ADC2)
B9	PF3 (ADC3)
B10	PF4 (ADC4)
B11	PF5 (ADC5)
B12	PF6 (ADC6)
B13	PF7 (ADC7)
B14	PA0 (AD0)
B15	PA1 (AD1)
B16	PA2 (AD2)
B17	PA3 (AD3)
B18	PA4 (AD4)
B19	PA5 (AD5)
B20	PA6 (AD6)
B21	PA7 (AD&)
B22	ALE
B23	PC7 (A15)
B24	PC6 (A14)
B25	PC5 (A13)
B26	PC4 (A12)
B27	PC3 (A11)
B28	PC2 (A10)
B29	PC1 (A9)
B30	PC0 (A8)
B31	
B32	EFLASH

### ISP Header



MMmega01 INT0  
MMmega02 ERTC

## **Power supply for modules**

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The module should be supplied from 5 V DC, terminals (VCC and GND). The module separates the supply voltage for the A/D converter (terminal AVCC) and ground for the analog part (terminal AGND). The reference voltage for the ADC is led to pin (AREF). When the internal battery is in use, its voltage is brought out to pin (VBAT), when, however, an external source is employed, its voltage should be also connected to pin (VBAT).

### **Simultaneous use of the internal and external voltage sources is not allowed !**

Current consumption by the module at 6 MHz clock frequency for the microcontroller is around 30 mA. Minimodule versions are available with 3.3 V supply voltage, for microcontrollers ATmega103L/128L.

## **Reset**

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The supply voltage monitoring circuit S1811/1817 enables the /RESET signal of the microcontroller if the supply voltage falls below 4.6 V. The /RESET line can be also switched externally, thereby allowing the reset of the microcontroller by external elements. External activation of the /RESET signal occurs after applying a LOW signal to the /RESET line (terminal (RST)). The circuit is monitored in the version with the ATmega103 microcontroller.

## **Real-time clock**

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The module has an inbuilt Real Time Clock (RTC) circuit with battery hold-up. The version with Mmega01 has a circuit with the I<sup>2</sup>C PCF8583 bus, but in the Mmega02 version with the SPI DS1305 bus. The hold-up voltage is provided by a lithium battery (CR2023) placed in a socket, or by an external source through terminal (VBAT).

In the version with the PCF8583 clock, lines SDA and SCL are brought out directly to microcontroller terminals (PD0 and PD1). The interrupt output INT of the clock circuit is brought for external connection through pin (INT0); this allows its connection with any terminal of the microcontroller. It can be also connected within the minimodule to port PE4 of the microcontroller by closing strap J3.

In the version with DS1305 clock, lines SDI, SDO, SCLK of the SPI bus are connected through the HC4053 multiplexer circuit with corresponding signals from the microcontrollers; this allows to disconnect the circuit from the bus at the instant of programming the flash memory in the microcontroller. The clock Chip Enable (CE) line is brought out externally to the minimodule through pin ERTC which permits its free connection with microcontroller's terminals; it is also possible to connect it to port PB5 of the microcontroller by shorting strap J3. Connection of the INT line of the clock circuit is identical as in the version with the PCF8583 clock.

## **Serial DataFlash memory**

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The minimodule has an inbuilt DataFlash memory with a capacity of up to 4 Mb, depending on the minimodule version. The memory communicates with the microcontroller by the quick SPI bus. The SPI memory bus has been connected through the 4053 multiplexer circuit with corresponding microcontroller signals. The Chip Select (CS) memory line has been brought out outside the minimodule through pin (EFLASH), it can be also connected directly with port PB4 of the microcontroller by shorting strap J1. At present, only DataFlash

memories supplied from 3.3 V are produced, with input lines resistant to 5 V signals. The supply voltage of 3.3 V for the memory is provided by a regulator consisting of three series-connected diodes.

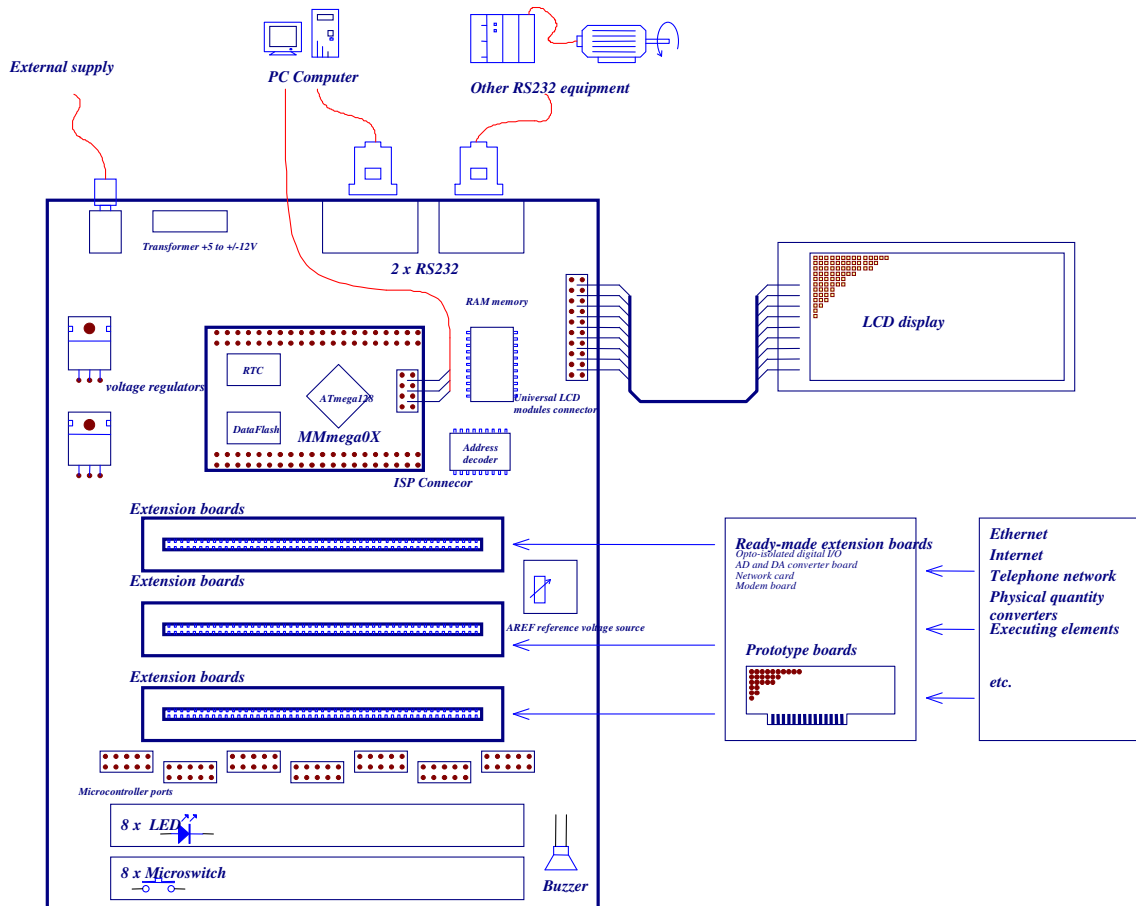
## ISP connector

The ISP connector is used for programming in the system. All signals from the ISP interface have been connected with the microcontroller through the HC4053 multiplexer, by which they can be disconnected from the rest of the module during the programming operation. This eliminates accidental writing into the RTC, DataFlash circuits or to the RS232 bus. The multiplexer is controlled by a LED signal; it must be connected with a LOW state during programming, which is signalled by a LED (ISP). The ISP connector is compatible with the STK300 circuit; for programming, an ISPCable or ISPCable II programmer produced by us, or any programmer compatible with this standard.

## Exemplary application

The choice of our minimodule is the first step in a design which has to be finished in a short time. The minimodule can be used both in prototype development, eliminating the need to design a printed board, and for a circuit produced serially in the form of a module to be placed in the final product as a “sandwich”, thereby saving board space and facilitating the assembly by eliminating soldering the element in the QFP casing.

The application demonstrates how a complete microprocessor system can be easily built by employing the minimodule and an evaluation circuit (EVB503).



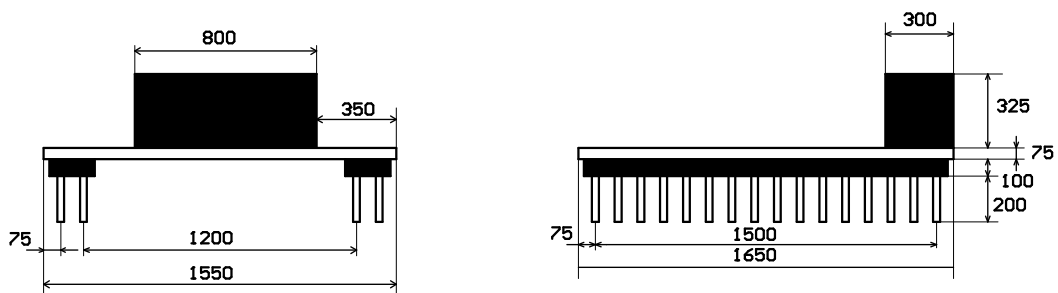
## Oscillator

Modules using ATmega128 microcontrollers are delivered with firmware controller operating mode with an internal RC oscillator operating at 1 MHz. Switching over to an external quartz crystal oscillator is achieved by setting appropriate fuse bits.

## Software

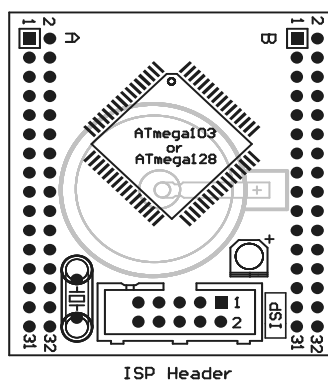
Along with the minimodule, the delivery includes software in C language in the form of function libraries realizing the communication with inbuilt peripherals. The newest software version and catalogue data on inbuilt peripherals of the minimodule are available on our web page [www.propox.com](http://www.propox.com)

## Dimensions

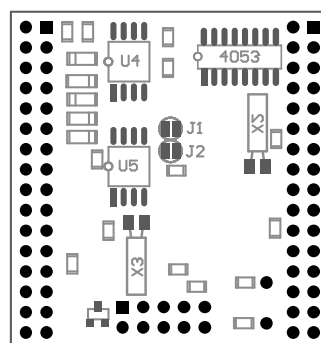


The dimension are in mils.  
 1mils – 1/1000<sup>th</sup> of an inch  
 100mils = 2,54mm (standard pitch)

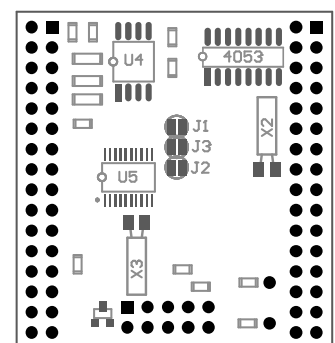
## Placement of elements



**MMmega00/01/02**  
 Top view

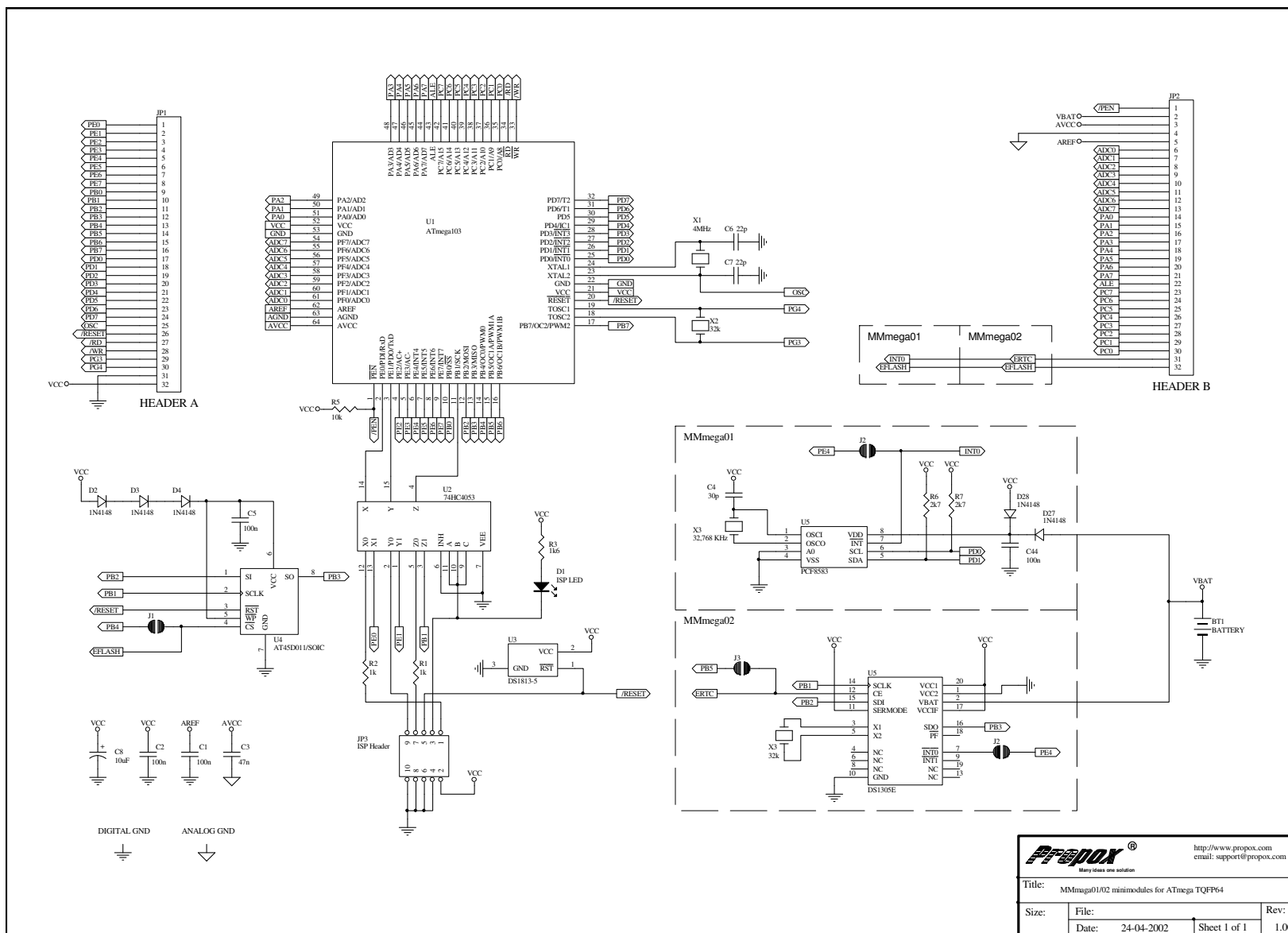


**MMmega01**  
 Bottom view



**MMmega02**  
 Bottom view

# Schema



		<a href="http://www.propox.com">http://www.propox.com</a> email: support@propox.com	
		Many ideas one solution	
Title: MMmega01/02 minimodules for ATmega TQFP4			
Size:	File:	Rev:	
	Date: 24-04-2002	Sheet 1 of 1	1.00