# EVBnet01

**Evaluation Board for
MMnet01/101**

## User
## Manual

REV 0.8

**Propox** ®
Many ideas one solution

# *Contents*

# Introduction

The EVBnet01 board was created with the aim of providing a hardware base for a designer of systems relying on the MMnet01/101 minimodules, allowing to realize and verify quickly one's own ideas. Having this in mind, the board has been designed in such a way that the user has access to all terminals of the module which are led out to connectors. The board houses also such peripherals as: LEDs, push-buttons, potentiometers, a LCD display, a RS232 and USB interface, a 1-Wire connector. All these elements are accessible through pin connectors, permitting their connection with any processor port. The board has also a large prototype area which permits the designer to connect other elements in any configuration. Due to the incision (v-cut) between the prototype area and the rest of the board, the prototype part can be broken off. The board contains also a power supply which relieves the user from the need to provide a regulated supply voltage.

Together with the board, we deliver source codes of the Nut/OS together with the TCP/IP stack as well as demonstration software.

The EVBnet01 along with the MMnet01/101 minimodule can be also used in didactic laboratories of informatics colleges and universities, illustrating aspects of co-operation of electronic circuits with the Ethernet/Internet networks. It can be also used to build circuits realizing thesis projects.

## Features

- Socket for the MMnet01/101 module
- Connector with all terminals of the MMnet01/101 module
- Connectors of all peripherals accessible on board
- +5V power supply
- Power switch
- USB port (with use of MMusb232 minimodule)
- RS232 port
- 1-Wire connector
- Connector for In System Programming
- Multiplexer separating the ISP connector from the rest of the system
- JTAG connector for in system programming and debugging
- connector for 2x16 LCD display[1]
- 8 LED diodes
- 4 push-buttons
- 2 potentiometers
- Buzzer
- Prototype design area

**Notice**: 1. Mounted optionally

# 2   The Board

## Placement of elements on the board
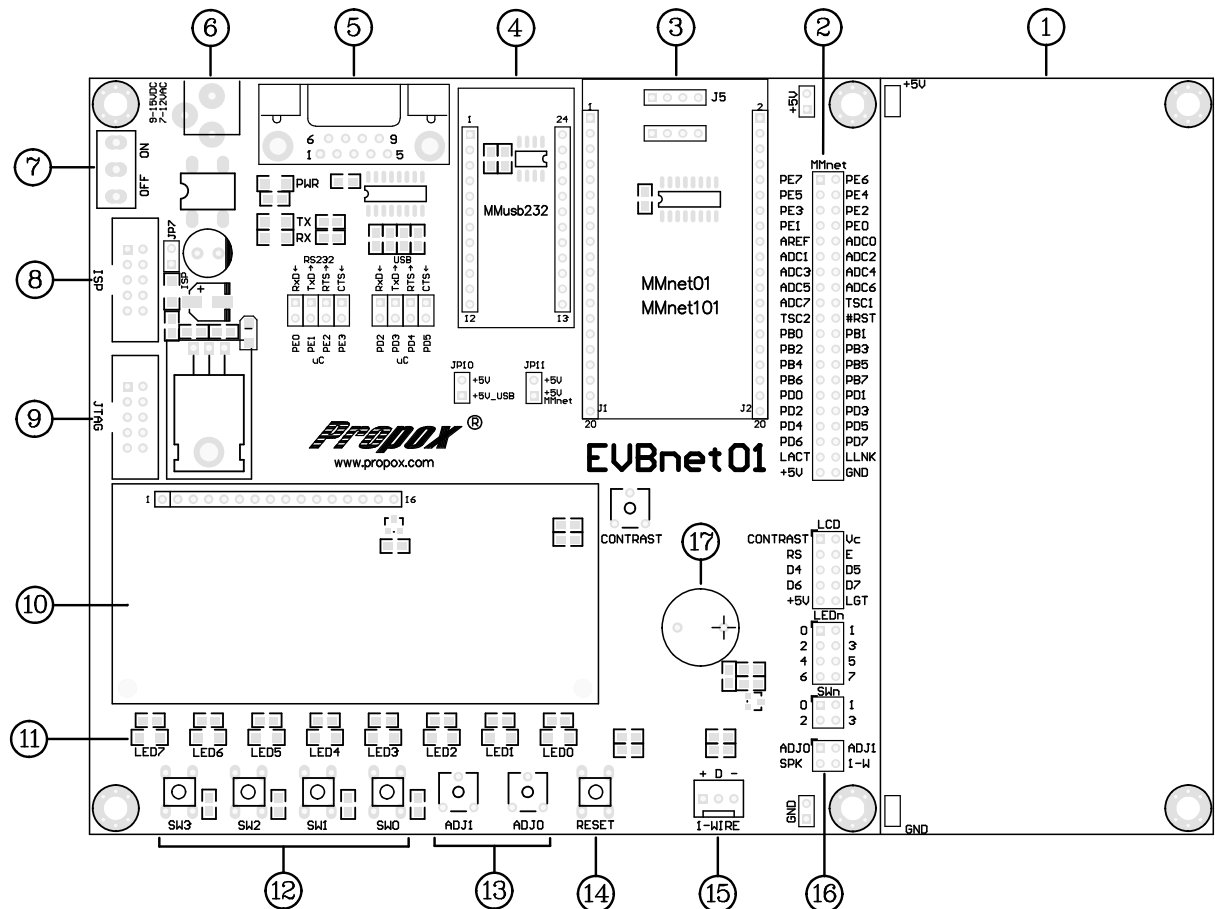


**Figure 1** Placement of elements on the EVBnet01 board.

1. Prototype area
2. Connector with led-out MMnet01/101 module terminals
3. MMnet01/101 minimodule
4. MMusb232 minimodule
5. RS232 connector
6. Supply connector
7. Power switch
8. Programming connector in the JTAG system
9. Programming/emulation connector in the JTAG system
10. LCD display
11. LED diodes
12. Push-buttons
13. Potentiometers
14. RESET button
15. 1-Wire connector
16. Peripheral connectors
17. Buzzer

# Arrangement on lead-outs

| Function in MMnet01/101 | Name | | | Name | Function in MMnet01/101 |
|---|---|---|---|---|---|
| | PE7 | 1 | 2 | PE6 | |
| Interrupt from RTL8019AS | PE5 | 3 | 4 | PE4 | |
| | PE3 | 5 | 6 | PE2 | |
| | PE1 | 7 | 8 | PE0 | |
| | AREF | 9 | 10 | ADC0 | |
| | ADC1 | 11 | 12 | ADC2 | |
| | ADC3 | 13 | 14 | ADC4 | |
| | ADC5 | 15 | 16 | ADC6 | |
| | ADC7 | 17 | 18 | TOSC1 | |
| | TOSC2 | 19 | 20 | #RESET | |
| | PB0 | 21 | 22 | PB1 | DataFlash – SCK |
| DataFlash - MOSI | PB2 | 23 | 24 | PB3 | DataFlash – MISO |
| | PB4 | 25 | 26 | PB5 | DataFlash – #CS |
| Bank select (optional) | PB6 | 27 | 28 | PB7 | |
| | PD0 | 29 | 30 | PD1 | |
| | PD2 | 31 | 32 | PD3 | |
| | PD4 | 33 | 34 | PD5 | |
| | PD6 | 35 | 36 | PD7 | |
| | LACT | 37 | 38 | LLNK | |
| | +5V | 39 | 40 | GND | |

# Board supply

The EVBnet01 board can be supplied in two ways:

- From an external power supply with an output of 7-12 V AC or 9-15 V DC, having a standard plug with a bolt diameter of 2.1 mm, connected to supply socket J3. In case of a DC supply voltage its polarity is irrelevant. Power is supplied to the module through JP11 jumper, which allows measurment of module current consupltion. During normal operation this jumper should be cosed.
- From USB connector. In this case JP1 jumper should be closed. Board houses also USB power switch, which allows drawing up to 500mA from USB bus.

**Notice:** Both supply methods should not be used simultaneously.

The regulated + 5 V voltage is led out to the J1 connector (+ 5V) and J14 (GND).
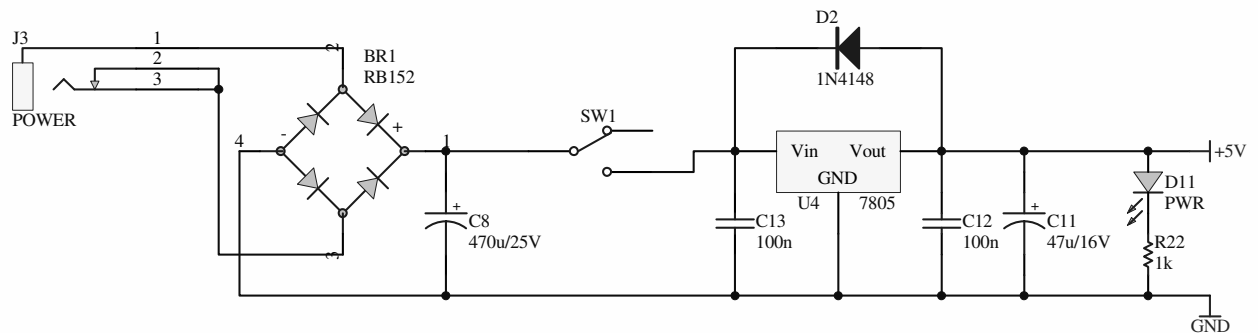


**Figure 2** Implementation of the power supply on the EVBnet01 board.

## LED diodes

The EVBnet01 has 8 LED diodes which play the role of the simplest interface between the system and the user. The board is constructed in such a way that it allows any connection between the diodes and microcontroller leads. A diode lights up when a low signal level is applied to appropriate leads. The LED current flowing into the microcontroller pin is about 3 mA.
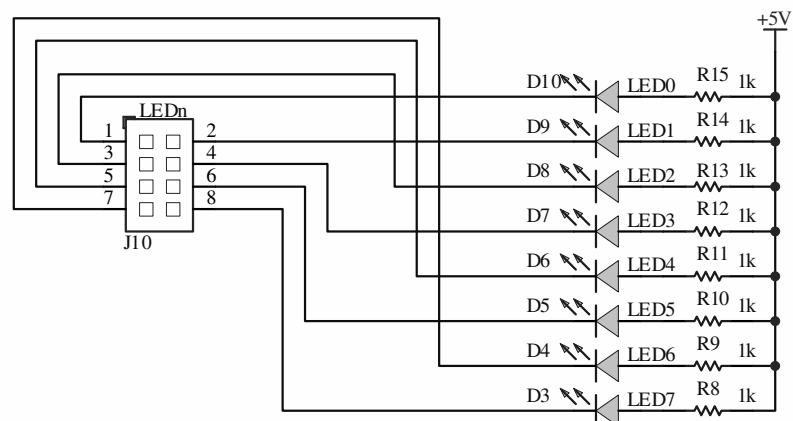


**Figure 3** Implementation of LED diodes.

## Push-buttons

The EVBnet01 board is equipped with four microswitches which can be connected to any lead of the microcontroller. Pushing a button causes a low state on any port terminal.
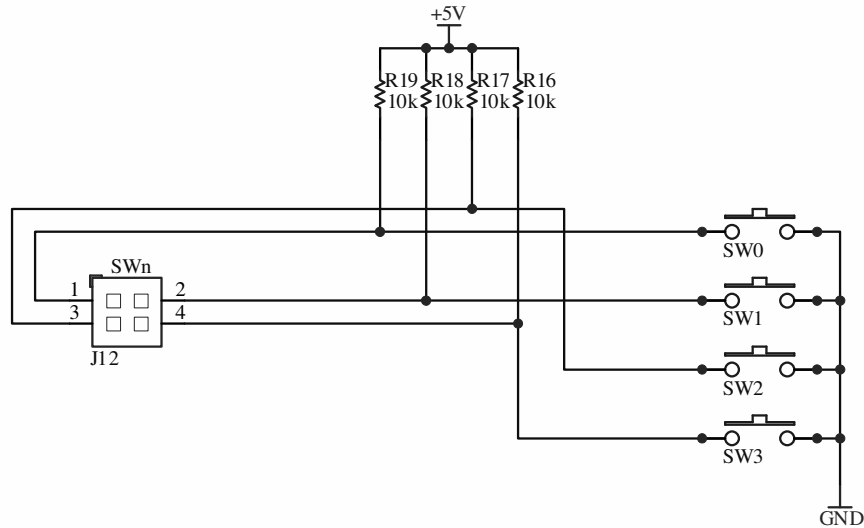
**Figure 4** Implementation of push-buttons.

## LCD display

EVBnet01 has place for standard 2x16 characters LCD display with HD44780 compatible controller. Display terminals D4-D7, RS, E, contrast and backlight are led to LCD connector J7. LCD connector is designed in this way, that it is possible to connect contrast signal to onboard potentiometer with use of jumpers, or with use of wire to any microcontroller pin, that can generate PWM (through RC low pass filter, which can be built on prototype area). Similarly, LCD backlight can be permanently turned on by closing jumper, or can be controlled by any microcontroller pin.

Because LCD connector contains only higher part of display bus, it has to work 4-bit mode. Also, RW line is permanently connected to ground, what allows only read operation, but it is sufficient to proper operation. Such approach minimizes required microcontroller port pins to six.
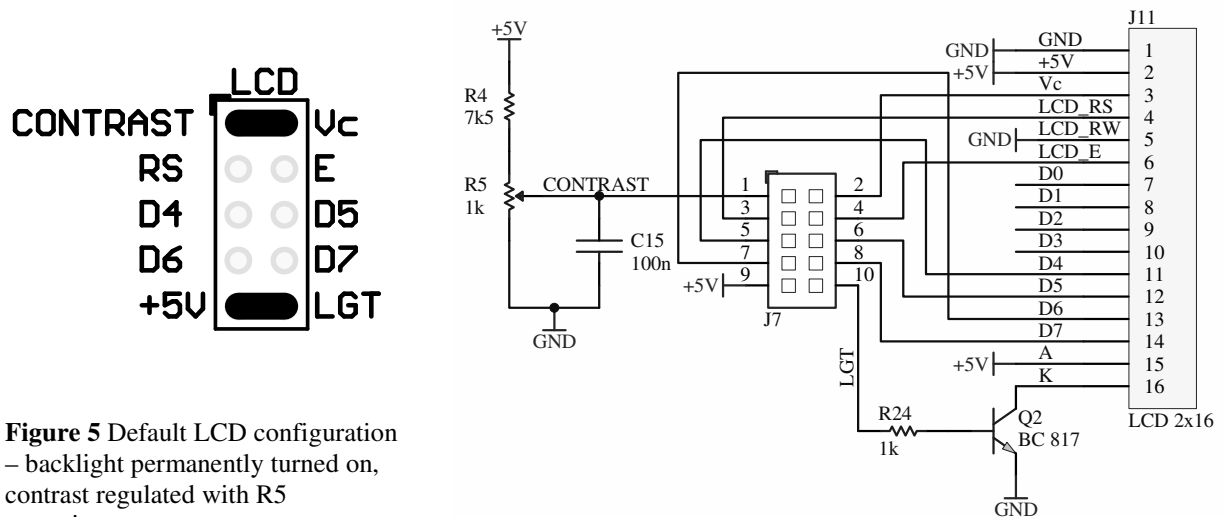


**Figure 5** Default LCD configuration – backlight permanently turned on, contrast regulated with R5 potentiometer.



**Figure 6** Connection of LCD display on the board.

## Potentiometers

EVBnet01 has two potentiometers, POT0 and POT1. The potentiometers can be used to simulate the outputs of analog circuits. The voltage across POTx terminals can be adjusted in the 0....REF range.
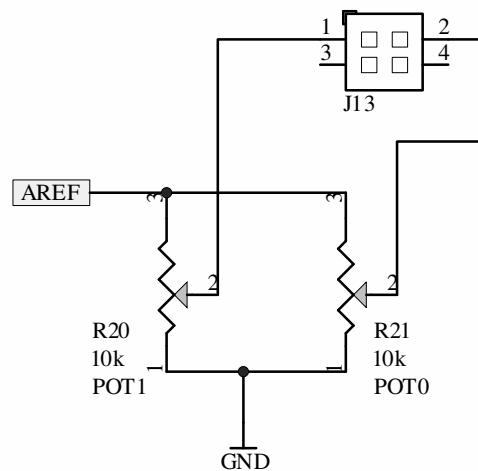


**Figure 7** Implementation of potentiometers.

# Buzzer

The board has a built-in acoustic signaler, controlled by a logic low state through a transistor. The base of the transistor is connected to connector J13 as SPK.
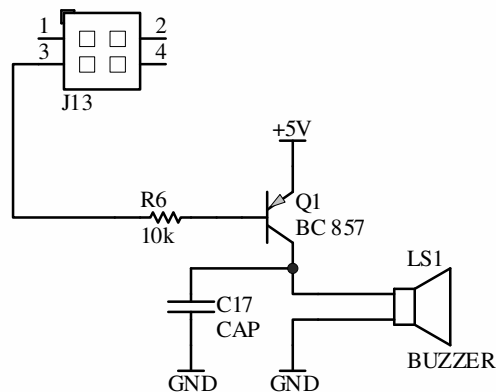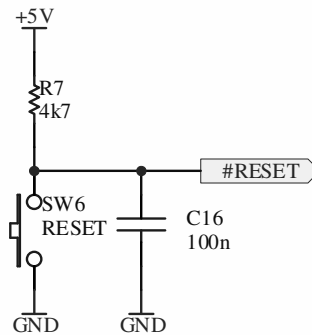


**Figure 8** Implementation of the Buzzer.

# RESET button

The EVBnet01 board has a led-out RESET signal which can be used as the output to reset external circuits and as the input to reset the module, e.g. through the RESET push-button. The EVBnet01 board is equipped with an on-board resetting button; by pressing it we force a low state on the RESET terminal of the module.

**Figure 9** Implementation of the RESET button.

## RS-232 interface

The EVBnet01 board has one port for serial RS232 transmission with a DB-9 connector. The lead-outs TxD, RxD, RTS, CTS are applied to the jumpers through a MAX232 level converter. The DSR and DTR signals have been shorted.

Applying jumpers causes the connection of TxD and RxD to the USART0 port of the microcontroller and of CTS and RTS signals to line PE2 and PE3, respectively. Signals of the RS232 port can be connected also to any lead-outs of the microcontroller by means of cables.

Notice: if flow control has not been implemented, signals CTS and RTS should be connected to each other by means of a jumpers (as shown in the figure) in order to assure proper communication.
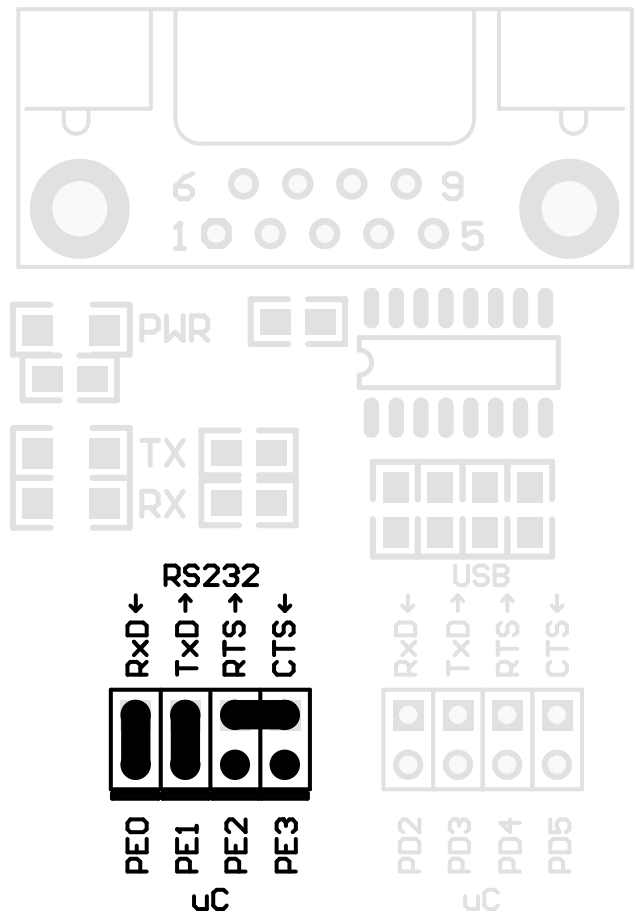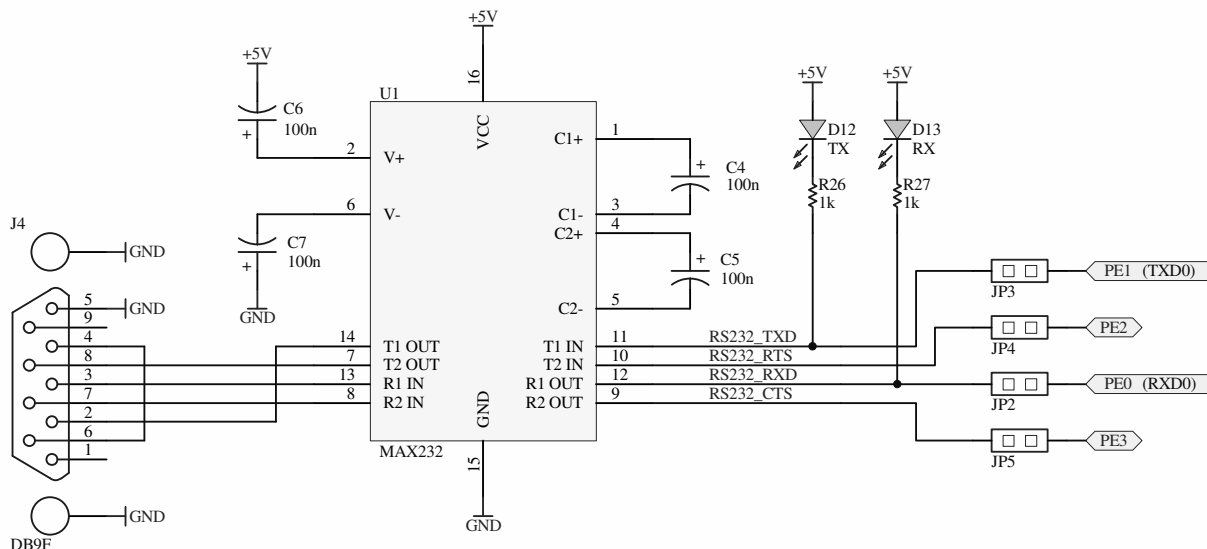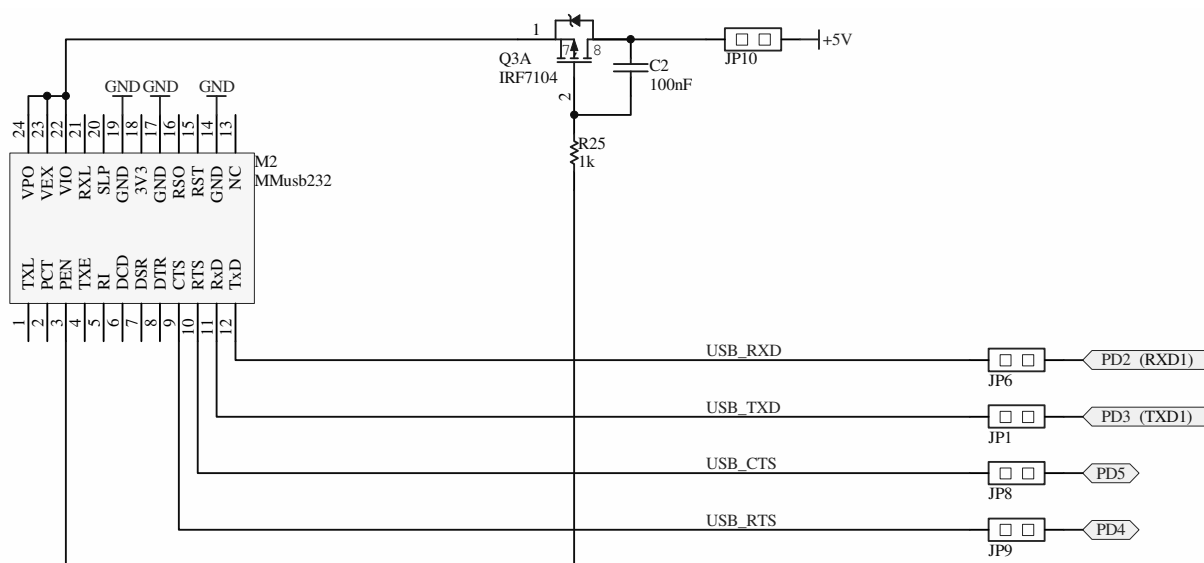
**Figure 10** Connection of the RS-232 port to the MMnet01/101.

# USB interface

The EVBnet01 board has also USB port, realized with use of MMusb232 minimodule.



**Figure 11** Connection of the USB port to the MMnet01/101.

Additionally board is equipped with USB power switch (based on Q3), with allows, accordingly to USB specification, drawing up to 500mA from USB bus. For proper operation of this switch it is required that „Pull Down IO Pins in USB Suspend" option in FT232BM settings is enabled.

The terminals TxD, RxD, RTS, CTS are connected to the jumpers. The DSR and DTR signals have been shorted

Applying jumpers causes the connection of TxD and RxD to the USART1 port of the microcontroller and of CTS and RTS signals to line PD5 and PD4, respectively. Signals of the RS232 port can be connected also to any lead-outs of the microcontroller by means of cables.

Attention: if flow control has not been implemented, signals CTS and RTS should be connected to each other by means of a jumpers (as shown in the figure) in order to assure proper communication.
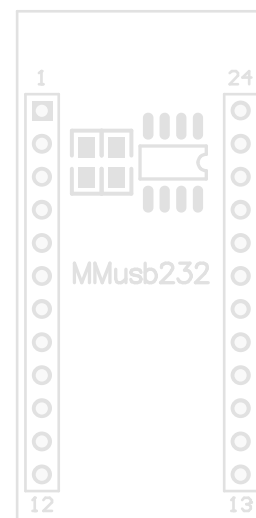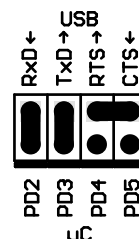
## 1-Wire Interface

The EVBnet01 board has a 1-Wire bus connector. This connector can be used to connect e.g. a digital DS1820 thermometer or Dallas/Maxim iButton reader from. The data signal has been applied to the J13 connector and designated as 1-W. It can be connected to any microcontroller lead-out by means of the attached cable.
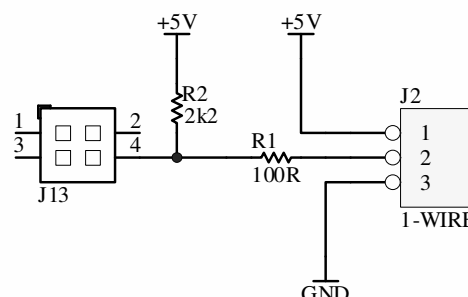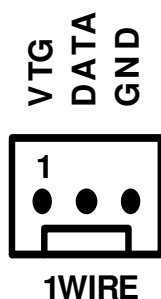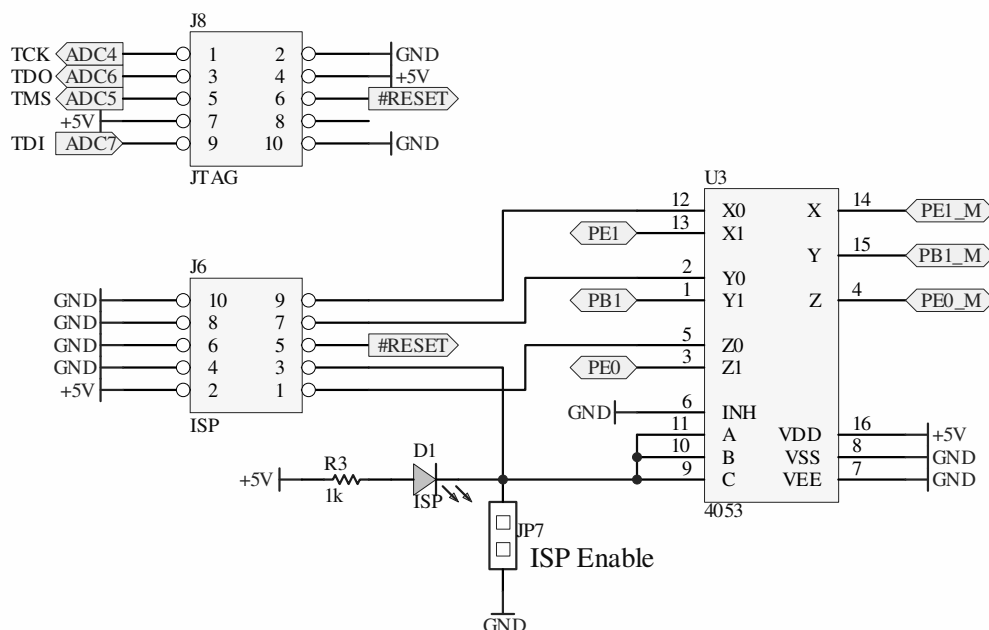
**Figure 12** Connection of the 1-Wire connector.

## ISP and JTAG connectors

Programming of the module can be effected through the ISP or JTAG interfaces (the second one permits also debugging in the system).

The ISP standard programmer communicates with the microcontroller through a three-wire SPI interface (plus the RESET signal and power supply). The interface uses the I/O pins of the microcontroller (PE0, PE1 and PB1) which, after programming, can perform usual functions. The LED signal controls the operation of multiplexer U3 which disconnects, for the duration of the programming session, the ISP bus lines from the peripheral circuits of the board, thus eliminating the possibility of an accidental writing operation into these circuits. During the writing operation this line should be in the low state. The JP7 short allows manual control of the multiplexer in case of using a programmer which is not serving this line.

JTAG is a four-lead interface permitting the takeover of control over the processor's core and its internal peripherals. The possibilities offered by this interface are, among others: step operation, full-speed operation, equipment and program pitfalls, inspection and modification of contents of registers and data memories. Apart from this, functions are available offered by ISP programmers: programming and readout of Flash, EEPROM, fuse and lock bits.
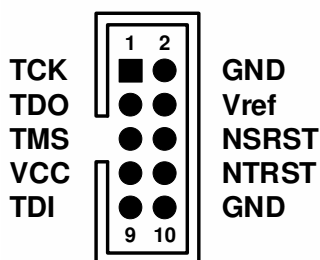


**Figure 13** Connection of the MMnet01/101 module with the JTAG connector.
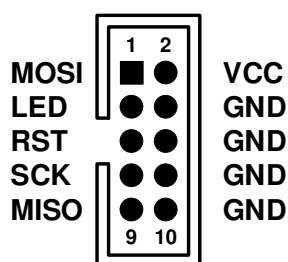


**Figure 14** ISP connector.

**Pin description**

| | |
|---|---|
| **MOSI** | Commands and data from programmer to target |
| **LED** | Multiplexer and LED diode driving signal |
| **RST** | RESET signal |
| **SCK** | Serial Clock, Controlled by programmer |
| **MISO** | Data from target AVR to programmer |
| **VCC** | Supply voltage to the programmer |
| **GND** | Ground |



**Figure 15** JTAG connector.

**Pin description**

| | |
|---|---|
| **TCK** | Test Clock, clock signal from emulator to target |
| **TDO** | Test Data Output, data signal from target to emul. |
| **TMS** | Test Mode Select, mode select signal from emulator to target |
| **VCC** | Supply voltage to the emulator |
| **TDI** | Test Data Input, data signal from emul. to target |
| **Vref** | Target voltage sense |
| **RST** | RESET signal |
| **GND** | Ground |

Programmers which may be used with EVBnet01 and MMnet01/101 may be found on pages:
- ISPCable I: http://www.propox.com/products/t_77.html?lang=en
- ISPCable II: http://www.propox.com/products/t_78.html?lang=en

JTAG programmer/emulator may be found on page:
- JTAGCable I: http://www.propox.com/products/t_99.html?lang=en

# 3 Technical assistance

In order to obtain technical assistance please contact support@propox.com . In the request please include the following information:
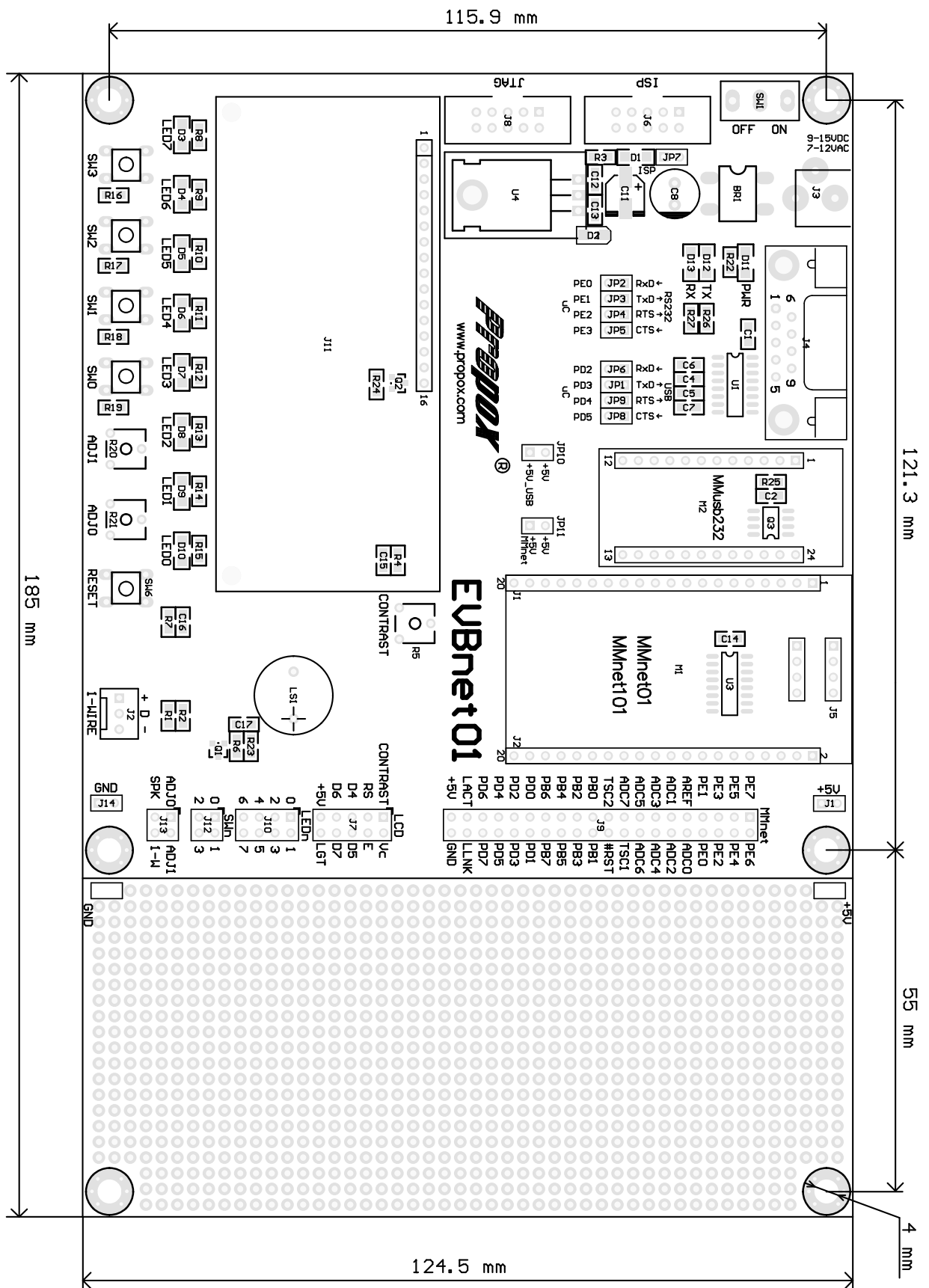
- Number of the board version (e.g. REV 2)
- Setting of resistors
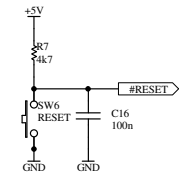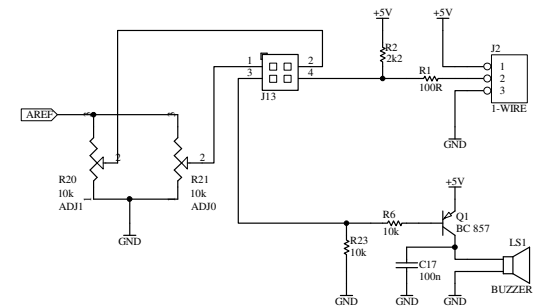- A detailed description of the problem

# 4 Guarantee

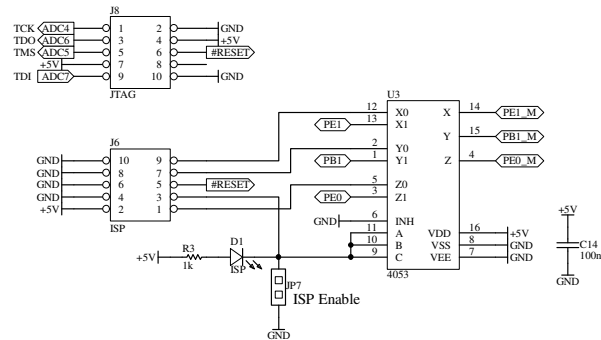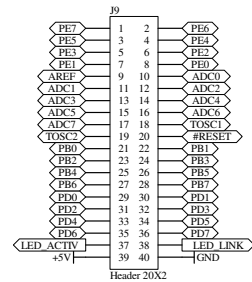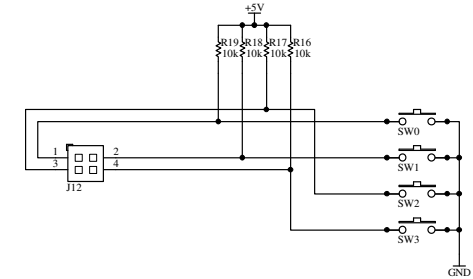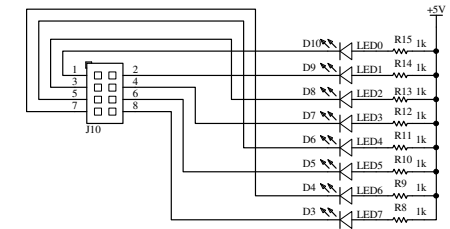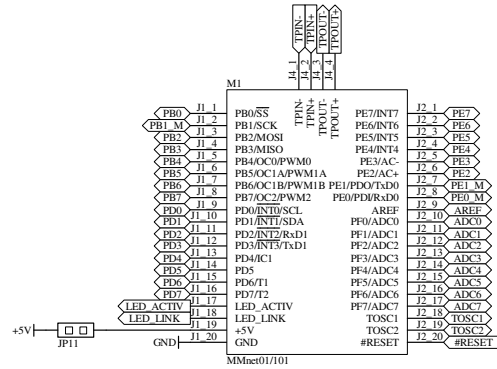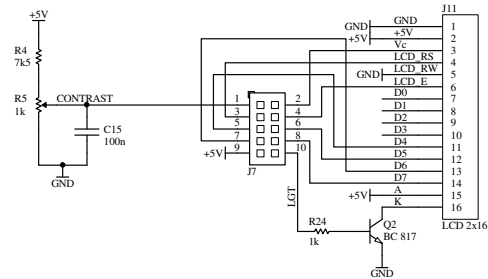The EVBnet01 board is covered by a six-month guarantee. All faults and defects not caused by the user will be removed at the Producer's cost. Transportation costs are borne by the buyer.

The Producer takes no responsibility for any damage and defects caused in the course of using the EVBnet01 board.
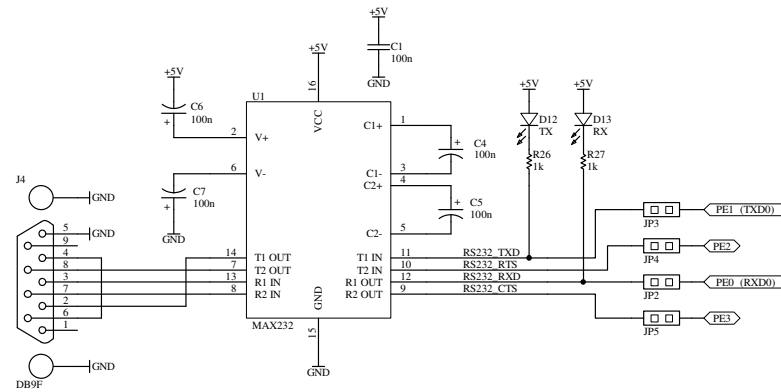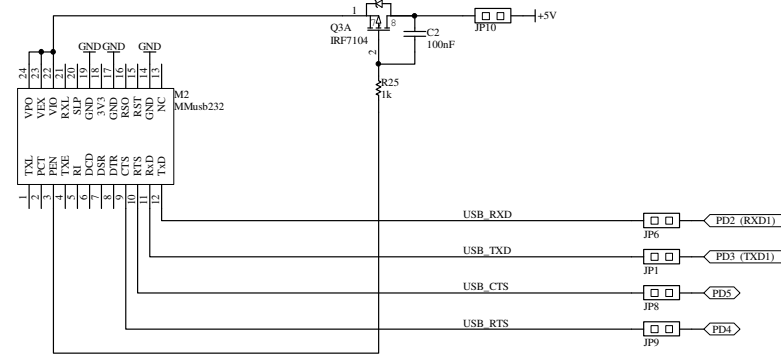
# 5 Board layout and dimensions



# 6 Schematics

Propox ®
Many ideas one solution

http://www.propox.com
email: support@propox.com

Title: EVBnet01

Size: | File: | Rev:
Date: 31-03-2005 | Sheet 1 of 2 | 1.00

## RS-232

+5V
C1
100n
GND

U1
VCC
16

+5V
C6
100n
V+
2

C7
100n
V-
6

C1+
1
C4
100n

C1-
C2+
3
4

C2-
5
C5
100n

T1 OUT
14
T1 IN
11
RS232_TXD
T2 OUT
7
T2 IN
10
RS232_RTS
R1 IN
13
R1 OUT
12
RS232_RXD
R2 IN
8
R2 OUT
9
RS232_CTS

GND
15
GND

MAX232

J4
GND

5
9
4
8
3
7
2
6
1

GND

DB9F
GND

+5V       +5V
D12       D13
TX        RX
R26       R27
1k        1k

JP3    PE1 (TXD0)
JP4    PE2
JP2    PE0 (RXD0)
JP5    PE3

MH1  MH2  MH4  MH5  MH3  MH6
GND  GND  GND  GND

## USB

GND GND    GND
24
23
22
21
20
19
18
17
16
15
14
13

VPO
VEX
VRD
RXL
SLP
GND
3V3
GND
RSO
RST
GND
NC

TXL
PCT
PEN
TXE
RI
DCD
DSR
DTR
CTS
RTS
RxD
TxD

1
2
3
4
5
6
7
8
9
10
11
12

M2
MMusb232

Q3A
IRF7104
1        8
C2
100nF
JP10    +5V

R25
1k

USB_RXD    JP6    PD2 (RXD1)
USB_TXD    JP1    PD3 (TXD1)
USB_CTS    JP8    PD5
USB_RTS    JP9    PD4

not mounted
TPIN-     1
TPIN+     2
TPOUT-    3
TPOUT+    4
J5
Header 4

## POWER

J3
1
2
3
POWER

BR1
RB152

4
-
+
+

SW1

D2
1N4148

Vin   Vout
GND
U4   7805

C8
470u/25V

C13
100n

C12
100n

C11
47u/16V

D11
PWR
R22
1k

+5V

GND

J14
GND   1
GND   2

J1
+5V   1
+5V   2

Propox ®
Many ideas one solution
http://www.propox.com
email: support@propox.com

Title: EVBnet01

Size:    File:                          Rev:
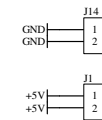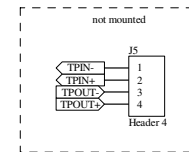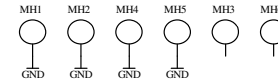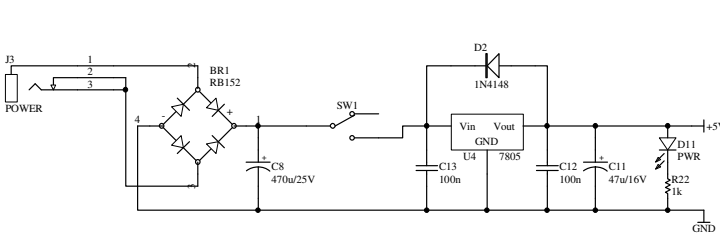         Date: 31-03-2005  Sheet 2 of 2  1.00

Propox ®
Many ideas one solution

**16**