

PIC-MAXI-WEB development board Users Manual

Rev.B, April 2009
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INTRODUCTION:

This board allows you to easily develop Ethernet connectivity applications. It has everything you normally would need for such applications: power relays which you can command through web interface, LCD display which will display messages you fill in web forms, analogue inputs for connection to sensors, digital optoisolated inputs, trimmer potentiometer, temperature sensor, Ethernet connector. With this board you can easily automate your home and then control and monitor it from any point in the world via Internet. An extension connector is available so you can connect custom made hardware to the board. The PIC18F97J60 has 128KB Flash program memory and there is external 1Mbit (128KB) flash memory for data storage. The on board DC/DC converter makes this board very tolerant to the external power supply which could be in 9-25V DC or 7-18V AC range. The bridge rectifier on the input allows AC and DC adapters to be used and makes power supply polarity problems go away.

BOARD FEATURES:

- PIC18F97J60 microcontroller with embedded Ethernet MAC and PHY and 128KB Flash programming space
- 1Mbit on board serial flash for web pages storage
- ICSP/ICD connector for programming and debugging with PIC-ICD2 and PIC-ICD2-POCKET.
- Temperature sensor
- Trimmer potentiometer connected to analogue input
- Two relays 10A/250VAC
- Four optoisolated digital inputs
- Twelve analogue inputs on terminal block
- Two buttons
- LCD 16x2 with backlight
- RS232 interface
- Ethernet interface
- Complete web server and TCP-IP stack support as per Microchip's open source TCP-IP stack
- Terminal block for power supply works with 9-25 VDC power supply
- Extension header to connect to other boards
- Dimensions 120x108 mm (4.72x4.25")

ELECTROSTATIC WARNING:

The PIC-MAXI-WEB board is shipped in protective anti-static packaging. The board must not be subject to high electrostatic potentials. General practice for working with static sensitive devices should be applied when working with this board.

BOARD USE REQUIREMENTS:

Cables: Depends on the used programming/debugging tool. It could be 1.8 meter USB A-B cable to connect PIC-ICD2-POCKET or PIC-ICD2 to USB host on PC or RS232 cable for PIC-ICD2-TINY and PIC-ICD2. You will

need a serial cable if not for programming, than for configuring the board. You will also need a LAN cable.

Hardware: Programmer/Debugger –Olimex programmers are applicable, for example **PIC-ICD2**, **PIC-ICD2-POCKET**, **PIC-ICD2-TINY** or other compatible programming/debugging tool.

!!!Warning!!! When you want to program this microcontroller with PIC-ICD2, PIC-ICD2-POCKET or PIC-ICD2-TINY, before connecting the programmer to your target board, you should first connect the programmer to your computer and open MPLAB. There, first from menu Configure – Select Device – choose the microcontroller you are about to program, then from menu Programmer – Select Programmer – choose MPLAB ICD 2, wait while MPLAB is downloading operation system, and after ICD2 is connected – check in menu Programmer – Settings – Power – there is option – Power target circuit from MPLAB ICD 2 – this option should be forbidden, you could not select it. Now it is safe to connect the programmer to your target board.

Software: PIC-WEB is tested with MPLAB IDE v.7.62 + MPLAB C18 C compiler. It is possible that the stack might not function properly if used with later versions of MPLAB IDE. You will also need a terminal program configured at 19 200 bps, 8N1 and no flow control.

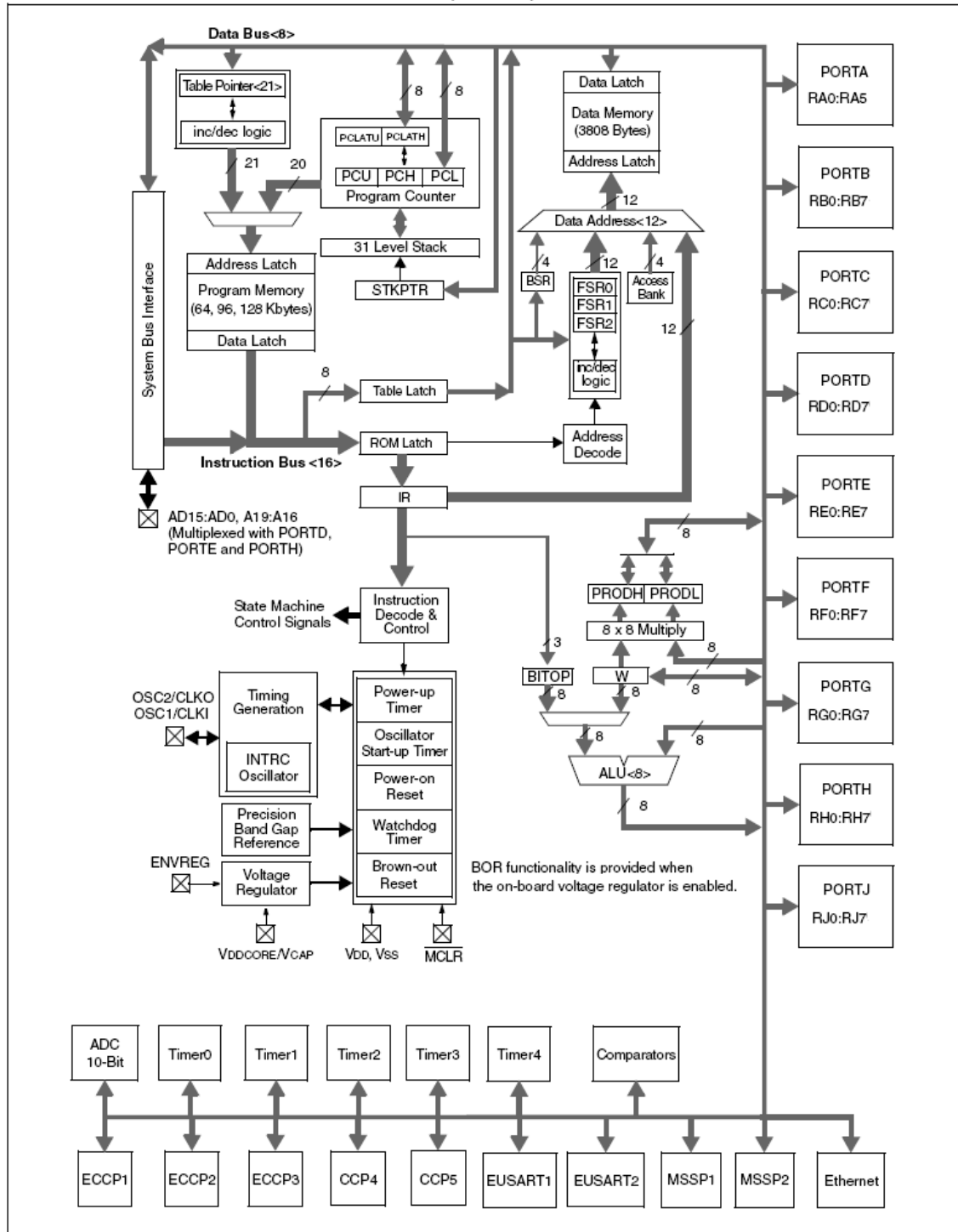
PROCESSOR FEATURES:

PIC-MAXI-WEB board use MCU **PIC18F97J60** from Microchip with these features:

- IEEE 802.3 compatible Ethernet Controller
- Integrated MAC and 10Base-T PHY
- 8-Kbyte Transmit/Receive Packet Buffer SRAM
- Supports One 10Base-T Port
- Programmable Automatic Retransmit on Collision
- Programmable Padding and CRC Generation
- Programmable Automatic Rejection of Erroneous Packets
- Activity Outputs for 2 LED Indicators
- Buffer:
 - o Configurable transmit/receive buffer size
 - o Hardware-managed circular receive FIFO
 - o Byte-wide random and sequential access
 - o Internal DMA for fast memory copying
 - o Hardware assisted checksum calculation for various protocols
- MAC:
 - o Support for Unicast, Multicast and Broadcast packets
 - o Programmable Pattern Match of up to 64 bytes within packet at user-defined offset
 - o Programmable wake-up on multiple packet formats
- PHY:

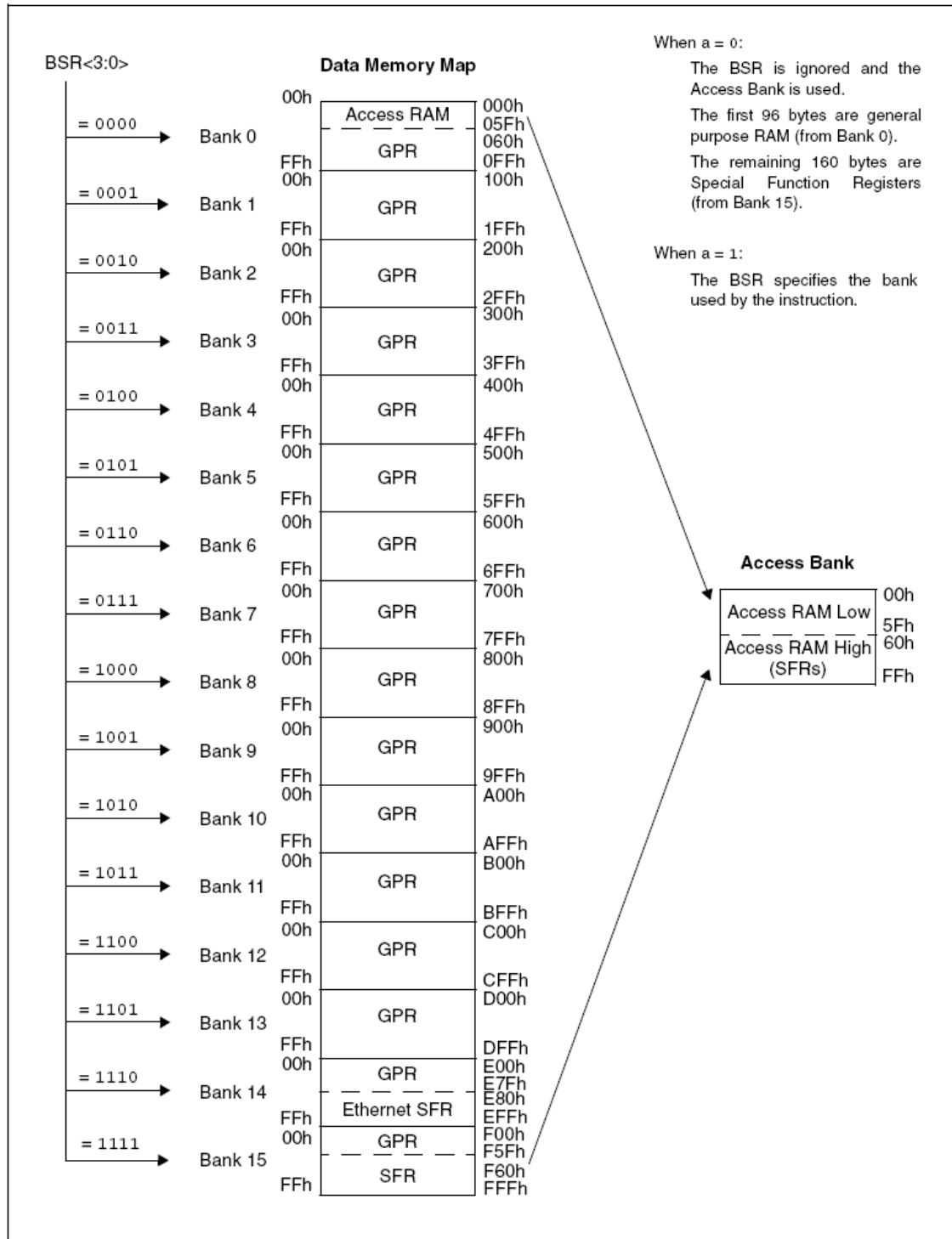
- Wave shaping output filter
- Selectable System Clock derived from Single 25 MHz External Source:
 - 2.778 to 41.667 MHz
- Internal 31 kHz Oscillator
- Secondary Oscillator using Timer1 @ 32 kHz
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if oscillator stops
- Two-Speed Oscillator Start-up
- Address Capability of up to 2 Mbytes for External Memory Bus
- 8-Bit or 16-Bit Interface
- 2-Bit, 16-Bit and 20-Bit Addressing modes
- High-Current Sink/Source: 25 mA/25 mA on PORTB and PORTC
- Five Timer modules (Timer0 to Timer4)
- Four External Interrupt pins
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to Two Master Synchronous Serial Port (MSSP) modules supporting SPI (all 4 modes) and I2C™ Master and Slave modes
- Up to Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-wake-up on Start bit
 - Auto-Baud Detect (ABD)
- 10-Bit, Up to 16-Channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Parallel Slave Port (PSP) module (100-pin devices only)
- 5.5V Tolerant Inputs (digital-only pins)
- Low-Power, High-Speed CMOS Flash Technology:
 - Self-reprogrammable under software control
- C compiler Optimized Architecture for Reentrant Code
- Power Management Features:
 - Run: CPU on, peripherals on
 - Idle: CPU off, peripherals on
 - Sleep: CPU off, peripherals off
- Priority Levels for Interrupts
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
 - Programmable period from 4 ms to 134s
- Single-Supply 3.3V In-Circuit Serial Programming™ (ICSP™) via Two Pins
- In-Circuit Debug (ICD) with 3 Breakpoints via Two Pins
- Operating Voltage Range of 2.35V to 3.6V (3.1V to 3.6V using Ethernet module)
- On-Chip 2.5V Regulator

BLOCK DIAGRAM:

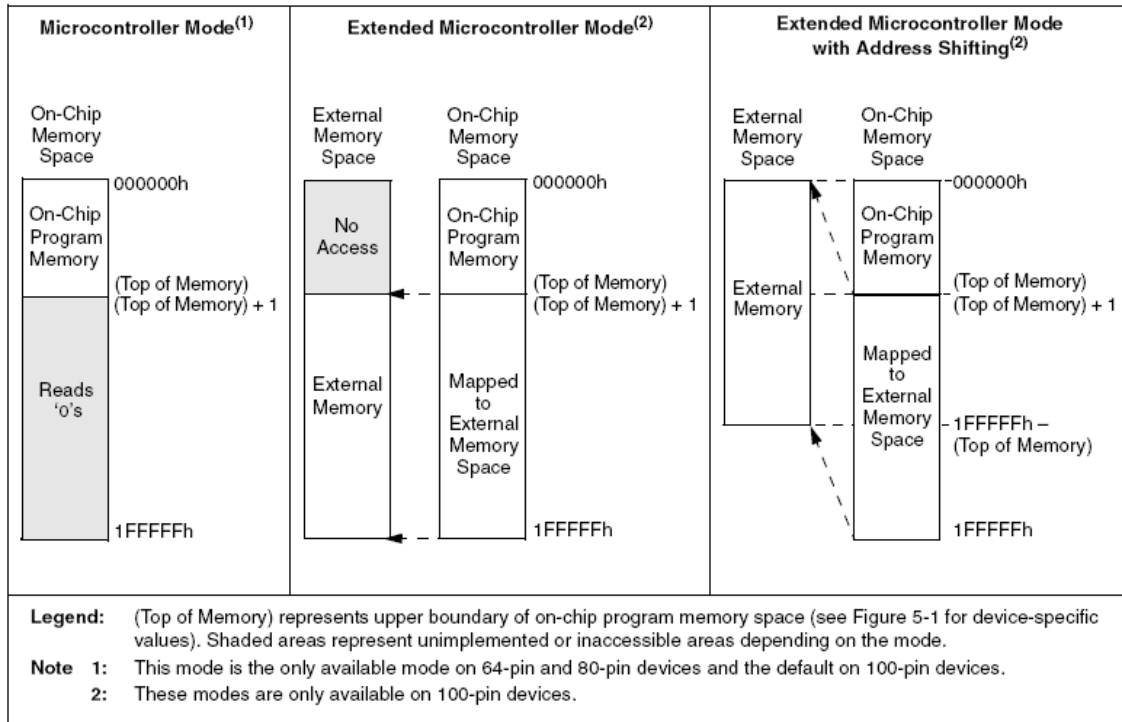


MEMORY MAP:

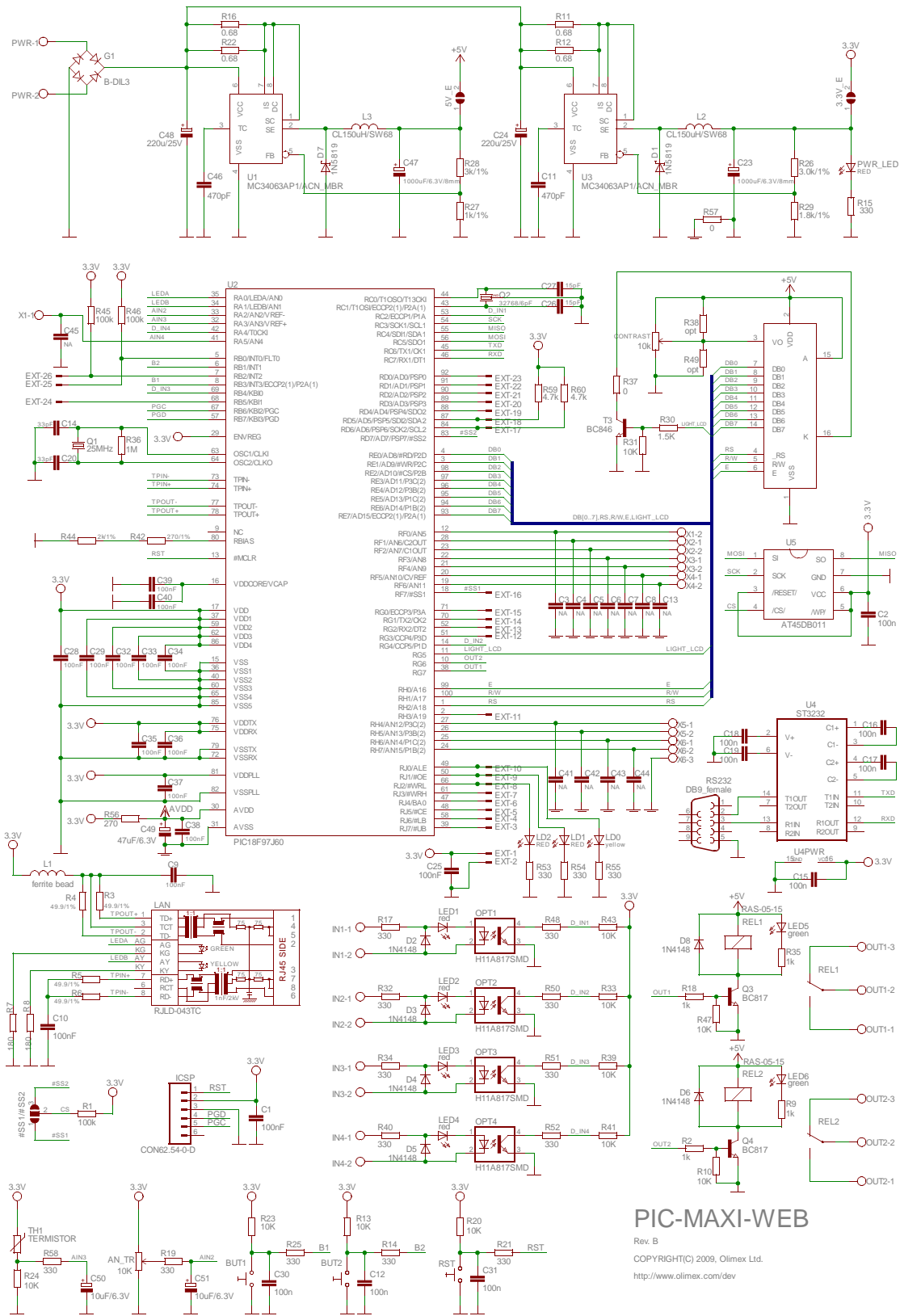
DATA MEMORY MAP FOR PIC18F97J60 FAMILY DEVICES



MEMORY MAPS FOR PIC18F97J60 FAMILY PROGRAM MEMORY MODES



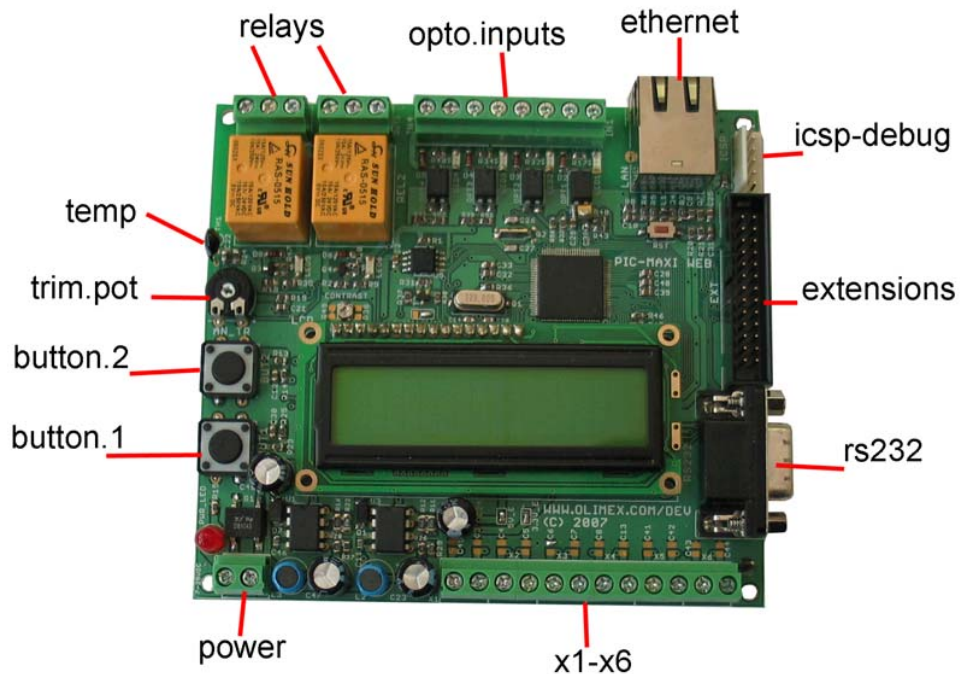
SCHEMATIC:



PIC-MAXI-WEB

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BOARD LAYOUT:



POWER SUPPLY CIRCUIT:

PIC-MAXI-WEB can take power only from power connector PWR, where (9-12) VDC or (6-9) VAC external voltage source has to be applied.

The board power consumption is about 200 mA with all peripherals and MCU running at full speed, relays and LEDs on and working Ethernet connection.

RESET CIRCUIT:

PIC-MAXI-WEB reset circuit is made with RC group R20 – 10k and C31 – 100nF. Serial resistor R21 – 330Ω is used to prevent fast C31 charge and discharge when **PIC18F97J60** is being programmed. Manual reset is possible by the RESET button.

CLOCK CIRCUIT:

Quartz crystal 25MHz is connected to **PIC18F97J60** pins OSC1 (CLK1) and OSC2 (CLKO). Internal PLL circuit can multiply this frequency up to 41MHz.

32.768 KHz quartz crystal is connected to **PIC18F97J60** pins T1SO and T1OSI for its internal Timer1.

JUMPER DESCRIPTION:

5V_E



enables 5V supply for LCD and relays.
Default state closed (shorted).

3.3V_E



enables 3.3V supply for **PIC18F97J60** and all other devices.
Default state closed (shorted). 3.3V is also available to EXT-1,
so if you want to connect external backup battery to the
PIC18F97J60 this jumper should be **opened** and the external
battery to be connected to EXT-1 pin.

#SS1/#SS2



chip select for U5 (AT45DB011) serial flash. Default position is
selected to be #SS2 in compatibles with Microchip
software but user can change it in its own application.
Default state closed (shorted)

INPUT/OUTPUT:

Two **User buttons** with names **BUT1** and **BUT2** – connected to
PIC18F97J60 pin 8 RB3/INT3/ECCP2(1)/P2A(1) and pin 6 RB1/INT1;

One **analog trimmer AN_TR** – connected to PIC18F97J60 pin 33
RA2/AN2/VREF-;

Thermistor TH1– connected to PIC18F97J60 pin 32 RA2/AN2/VREF+;

Three **LEDs** – **LDO** (yellow) – connected to PIC18F97J60 pin 49 RJ0/ALE ,
LD1 (red) – connected to PIC18F97J60 pin 50 RJ1/#OE, **LD2** (red) –
connected to PIC18F97J60 pin 66 RJ2/#WRL;

Four **opto isolated** digital inputs **IN1-IN4**;

Four red **LEDs** – **LED1, LED2, LED3, LED4** for every digital input;

Two green **LEDs** – **LED5, LED6** – for the relays;

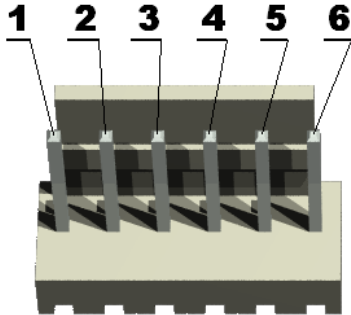
Power supply red **LED** with name **PWR_LED** – indicates that 3.3V power
supply is available

Twelve **analog inputs X1-X6**;

LCD Display - SC1602A - 16 characters x 2 lines.

EXTERNAL CONNECTOR DESCRIPTION:

ICSP:



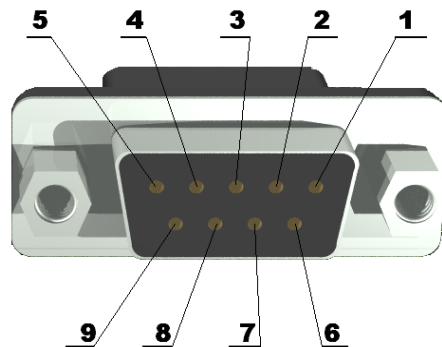
| Pin # | Signal Name |
|-------|-------------|
| 1 | RST |
| 2 | VCC |
| 3 | GND |
| 4 | PGD |
| 5 | PGC |
| 6 | NC |

PGD I/O **Program Data.** Serial data for programming.

PGC Input **Program Clock.** Clock used for transferring the serial data (output from ICSP, input for the MCU).

RS232:

| Pin # | Signal Name |
|-------|-------------|
| 1 | NC |
| 2 | TXD |
| 3 | RXD |
| 4 | NC |
| 5 | GND |
| 6 | NC |
| 7 | NC |
| 8 | NC |
| 9 | NC |

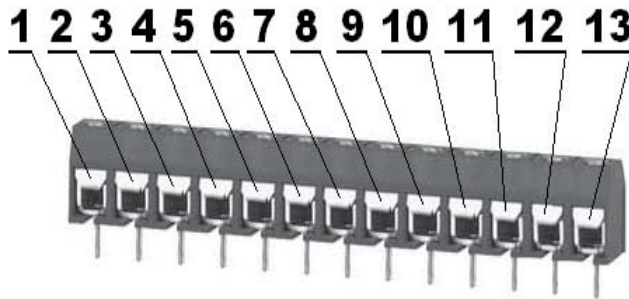


TXD Output **Transmit Data.** This is the asynchronous serial data output (RS232) for the shift register on the UART controller.

RXD Input **Receive Data.** This is the asynchronous serial data input (RS232) for the shift register on the UART controller.

X(1÷6)-CONNECTORS

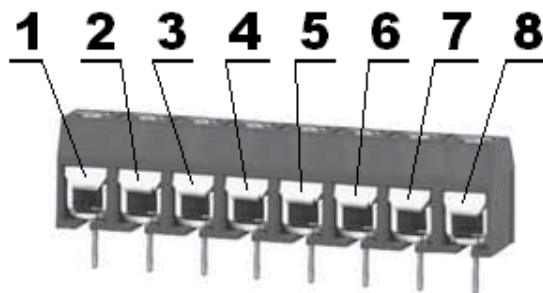
| Pin # | Signal Name |
|-------|-------------|
| 1 | AIN4 |
| 2 | AIN5 |
| 3 | AIN6 |
| 4 | AIN7 |
| 5 | AIN8 |
| 6 | AIN9 |
| 7 | AIN10 |
| 8 | AIN11 |
| 9 | AIN12 |
| 10 | AIN13 |
| 11 | AIN14 |
| 12 | AIN15 |
| 13 | GND |



These are the 12 analog inputs.

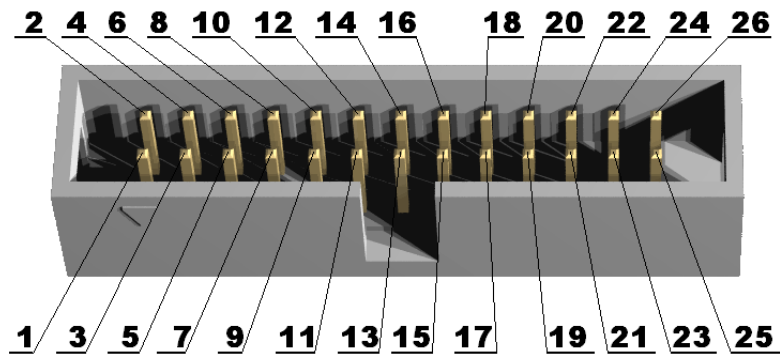
IN(1÷4)-CONNECTORS

| Pin # | Signal Name |
|-------|-------------|
| 1 | IN1+ |
| 2 | IN1- |
| 3 | IN2+ |
| 4 | IN2- |
| 5 | IN3+ |
| 6 | IN3- |
| 7 | IN4+ |
| 8 | IN4- |



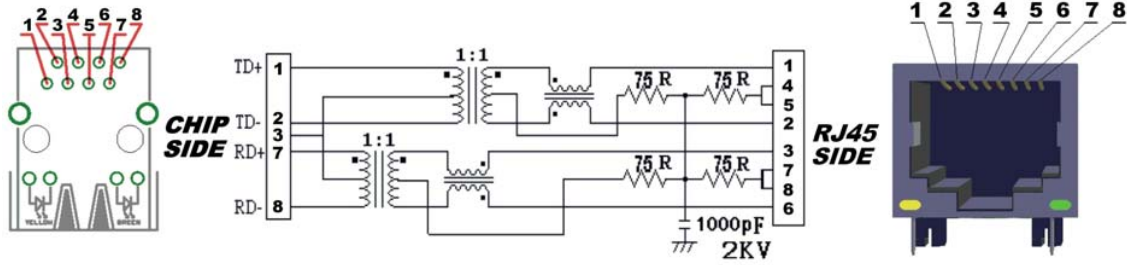
These are the 4 opto isolated digital inputs.

EXT:



| Pin # | Signal Name | Pin # | Signal Name |
|-------|------------------------|-------|------------------------|
| 1 | VCC | 2 | GND |
| 3 | RJ7/#UB | 4 | RJ6/#LB |
| 5 | RJ5/#CE | 6 | RJ4/BA0 |
| 7 | RJ3/#WRH | 8 | RJ2/#WRL |
| 9 | RJ1/#OE | 10 | RJ0/ALE |
| 11 | RH3/A19 | 12 | PG3/CCP4/P3D |
| 13 | RG2/RX2/DT2 | 14 | RG1/TX2/CK2 |
| 15 | RG0/ECCP3/P3A | 16 | RF7/#SS1 |
| 17 | RD6/AD6/PSP6/SCK2/SCL2 | 18 | RD5/AD5/PSP5/SDI2/SDA2 |
| 19 | RD4/AD4/PSP4/SDO2 | 20 | RD3/AD3/PSP3 |
| 21 | RD2/AD2/PSP2 | 22 | RS1/AD1/PSP1 |
| 23 | RD0/AD0/PSP0 | 24 | RB5/KBI1 |
| 25 | RB0/INT0/FLT0 | 26 | RB2/INT2 |

LAN:



| Pin # | Signal Name Chip Side | Pin # | Signal Name Chip Side |
|-------|-----------------------|-------|-----------------------|
| 1 | TPOUT+ | 5 | Not Connected (NC) |
| 2 | TPOUT- | 6 | Not Connected (NC) |
| 3 | 3.3V | 7 | TPIN+ |
| 4 | Not Connected (NC) | 8 | TPIN- |

| LED | Color | Usage |
|-------|--------|-------------------------------|
| Right | Yellow | Activity |
| Left | Green | 100Mbits/s (Half/Full duplex) |

RELAYS:

| Pin # | Signal Name |
|-------|--------------|
| 1 | Normal Open |
| 2 | Common |
| 3 | Normal Close |

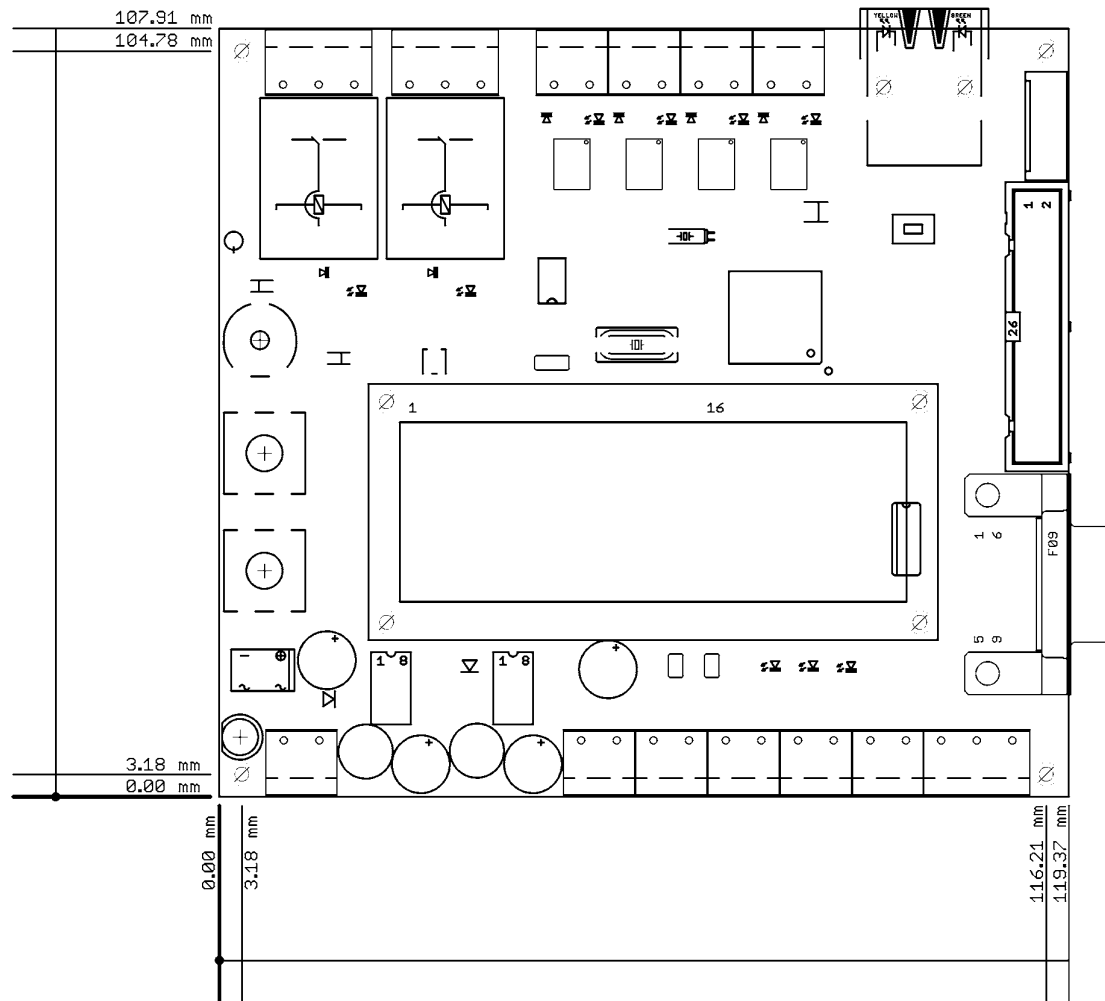


PWR:

| Pin # | Signal Name |
|-------|-------------|
| 1 | AC in 1 |
| 2 | AC in 2 |



MECHANICAL DIMENSIONS:



All measures are in mm.

AVAILABLE DEMO SOFTWARE:

You could find information about PIC-MAXI-WEB board, Microchip TCP/IP stack and how to change and configure the software in **Understanding PIC WEB boards** on www.olimex.com/dev.

ORDER CODE:

PIC-MAXI-WEB – assembled and tested (no kit, no soldering required)

How to order?

You can order to us directly or by any of our distributors.

Check our web www.olimex.com/dev for more info.



All boards produced by Olimex are RoHS compliant

Revision history:

REV.A - created July 2008

REV B - created April 2009

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