PIC-MAXI-WEB development board

Users Manual

Rev.B, February 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
- LCD16x2 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 or PIC-ICD2-POCKET to USB host on PC or RS232 cable. 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** or other compatible programming/debugging tool.

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:
    - Configurable transmit/receive buffer size
    - Hardware-managed circular receive FIFO
    - Byte-wide random and sequential access
    - Internal DMA for fast memory copying
    - Hardware assisted checksum calculation for various protocols
- MAC:
    - Support for Unicast, Multicast and Broadcast packets
    - Programmable Pattern Match of up to 64 bytes within packet at user-defined offset
    - 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
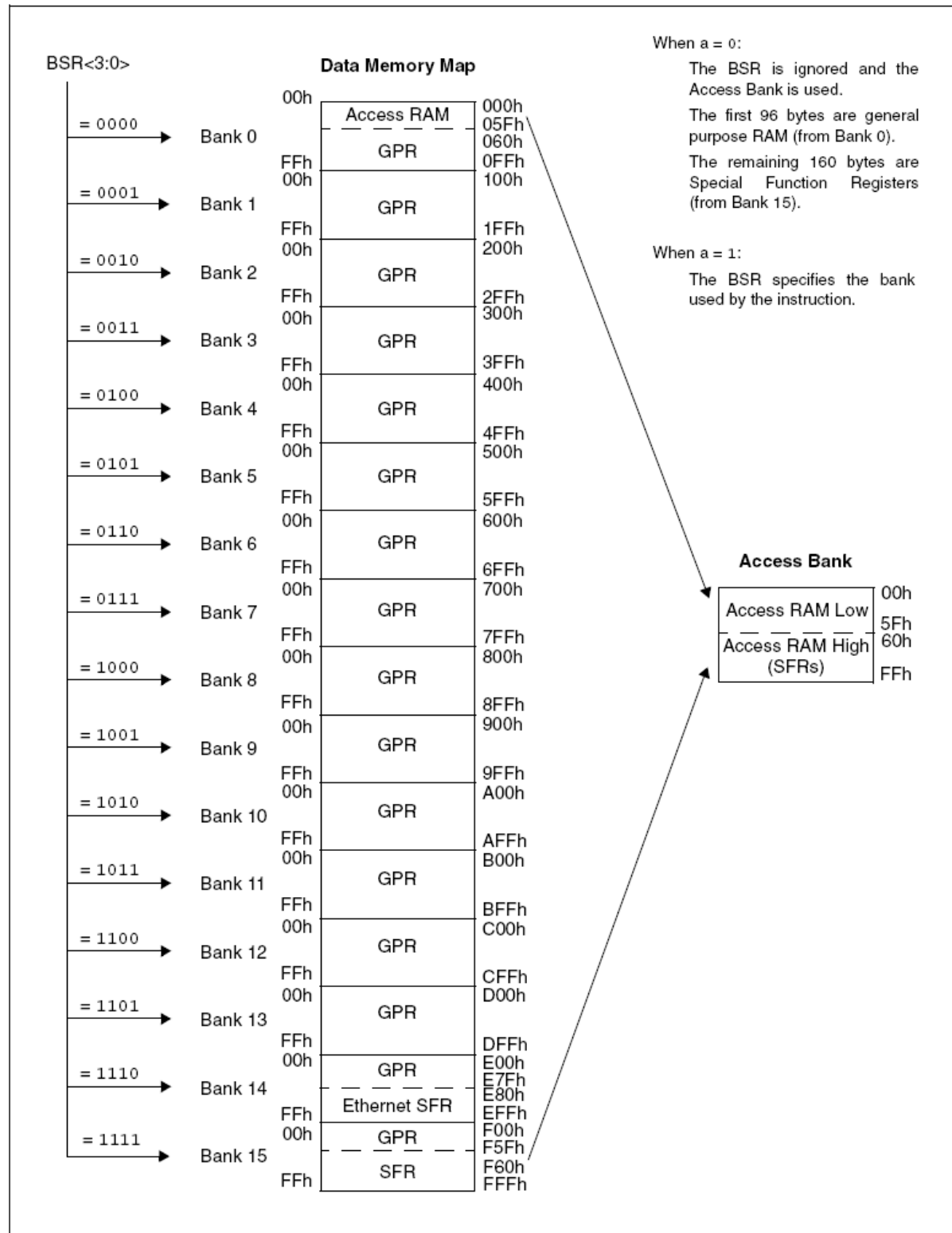   - Auto-shutdown and auto-restart

- 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)
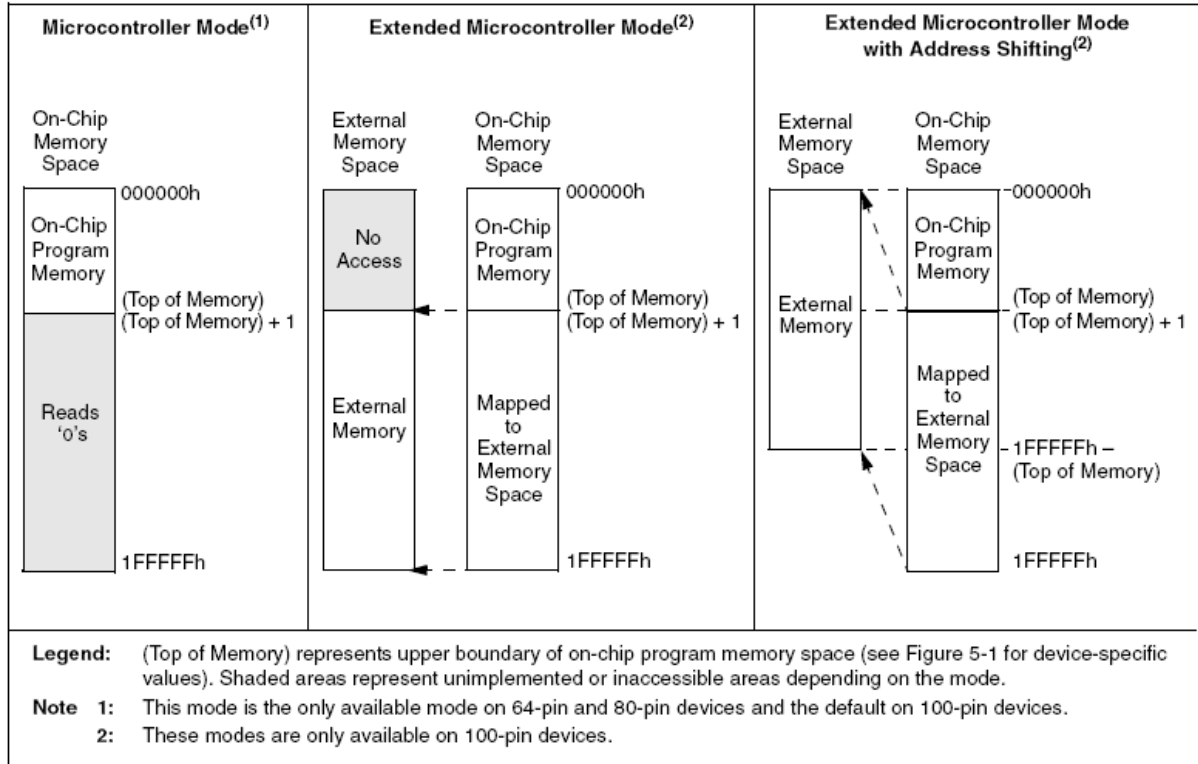- On-Chip 2.5V Regulator
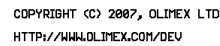
BLOCK DIAGRAM:
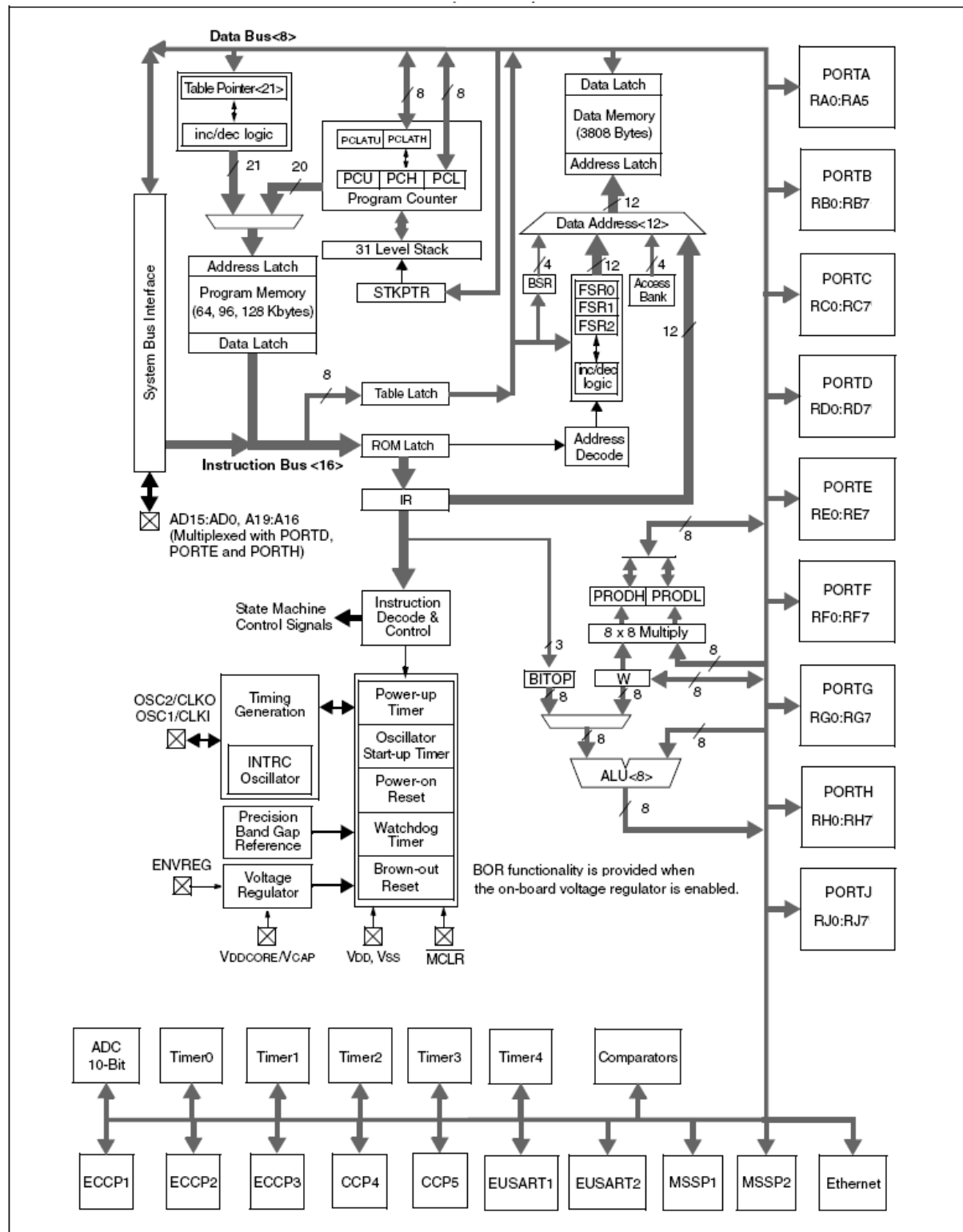
MEMORY MAP:

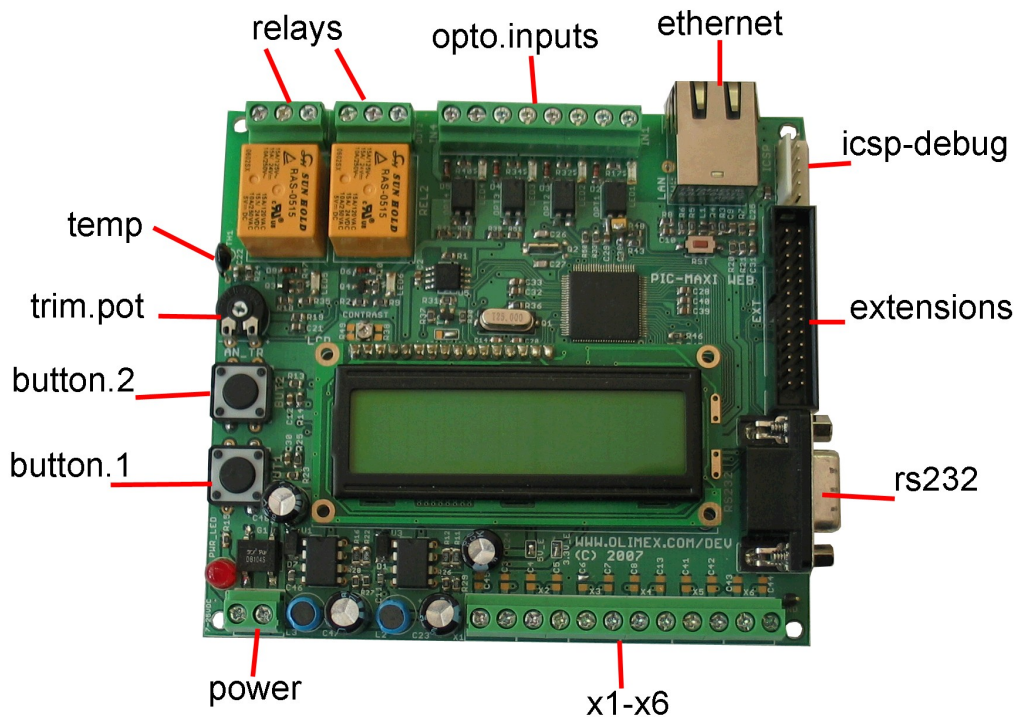## DATA MEMORY MAP FOR PIC18F97J60 FAMILY DEVICES

MEMORY MAPS FOR PIC18F97J60 FAMILY PROGRAM MEMORY MODES

Microcontroller Mode[1]

On-Chip Memory Space

On-Chip Program Memory — 000000h

(Top of Memory)
(Top of Memory) + 1

Reads '0's

1FFFFFh

Extended Microcontroller Mode[2]

External Memory Space

No Access

External Memory

On-Chip Memory Space

On-Chip Program Memory — 000000h

(Top of Memory)
(Top of Memory) + 1

Mapped to External Memory Space

1FFFFFh

Extended Microcontroller Mode with Address Shifting[2]

External Memory Space

External Memory

On-Chip Memory Space

On-Chip Program Memory — 000000h

(Top of Memory)
(Top of Memory) + 1

Mapped to External Memory Space

1FFFFFh – (Top of Memory)

1FFFFFh

Legend: (Top of Memory) represents upper boundary of on-chip program memory space (see Figure 5-1 for device-specific values). Shaded areas represent unimplemented or inaccessible areas depending on the mode.

Note 1: This mode is the only available mode on 64-pin and 80-pin devices and the default on 100-pin devices.

2: These modes are only available on 100-pin devices.

SCHEMATIC:

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** – **LD0** (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;

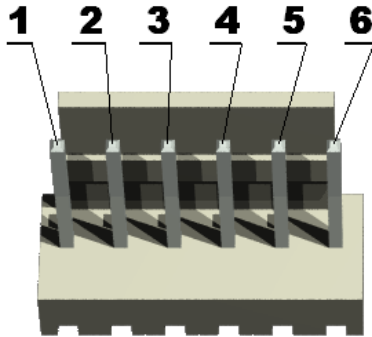Two green **LEDs** – **LED5**, **LED6** – for the relays;

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.

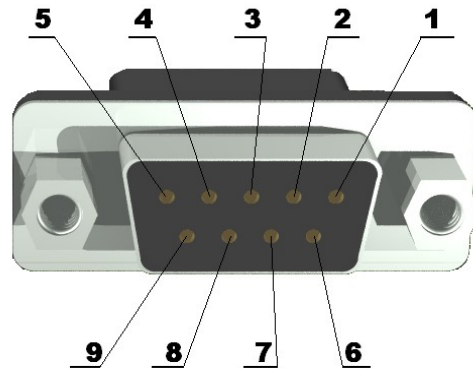# EXTERNAL CONNECTOR DESCRIPTION:

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
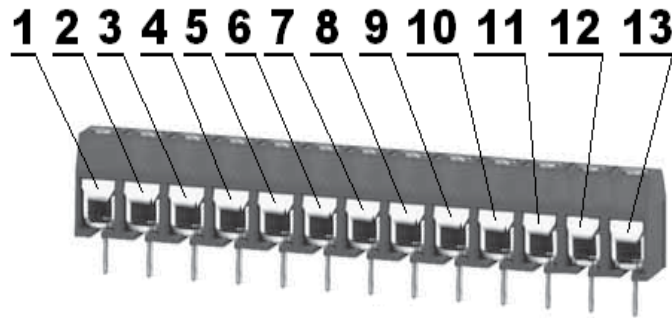
These are the 12 analog inputs.

IN(1÷4)-CONNECTORS

Pin #	Signal Name
1	IN1+
2	IN1-
3	IN2+
4	IN2-
5	IN3+
6	IN3-
7	IN4+
8	IN4-
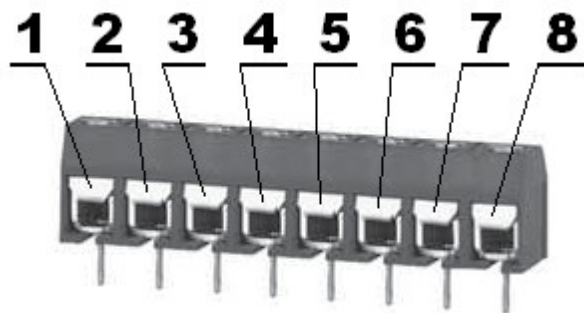
These are the 4 opto isolated digital inputs.

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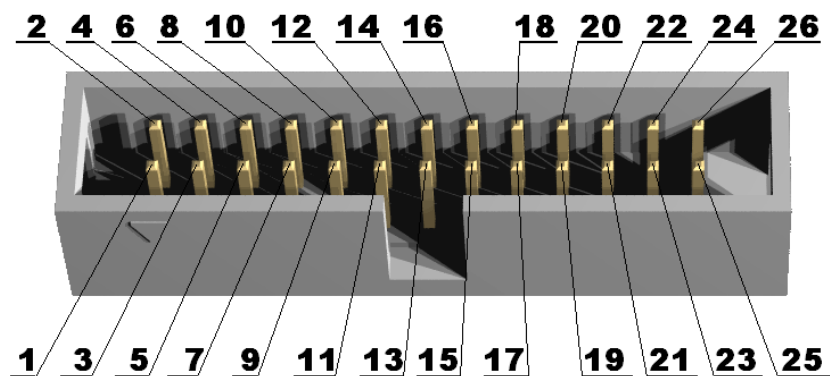
Pin #	Signal Name	Pin #	Signal Name
1	VCC	2	GND
3	RJ7/#UB	4	RJ6/#LB
5	RJ5/#CE	6	RJ4/BA0
7	RJ3/#WRH	8	RJ2/#WRL
9	RJ1/#OE	10	RJ0/ALE
11	RH3/A19	12	PG3/CCP4/P3D
13	RG2/RX2/DT2	14	RG1/TX2/CK2
15	RG0/ECCP3/P3A	16	RF7/#SS1
17	RD6/AD6/PSP6/SCK2/SCL2	18	RD5/AD5/PSP5/SDI2/SDA2
19	RD4/AD4/PSP4/SDO2	20	RD3/AD3/PSP3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

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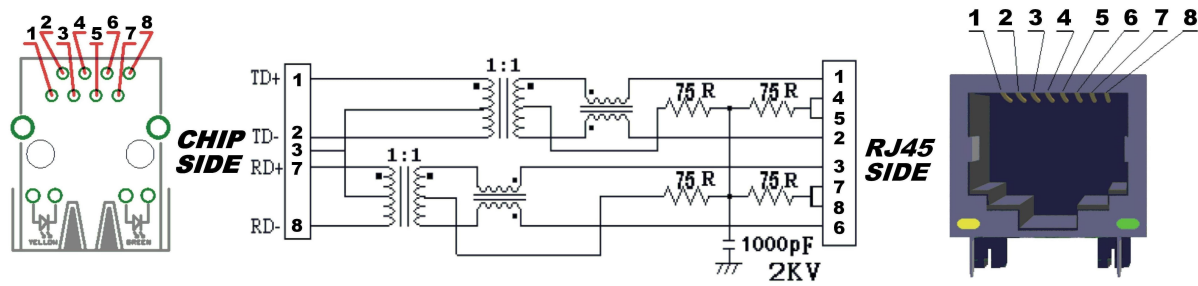
Pin #	Signal Name Chip Side	Pin #	Signal Name Chip Side
1	TPOUT+	5	Not Connected (NC)
2	TPOUT-	6	Not Connected (NC)
3	3.3V	7	TPIN+
4	Not Connected (NC)	8	TPIN-

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:
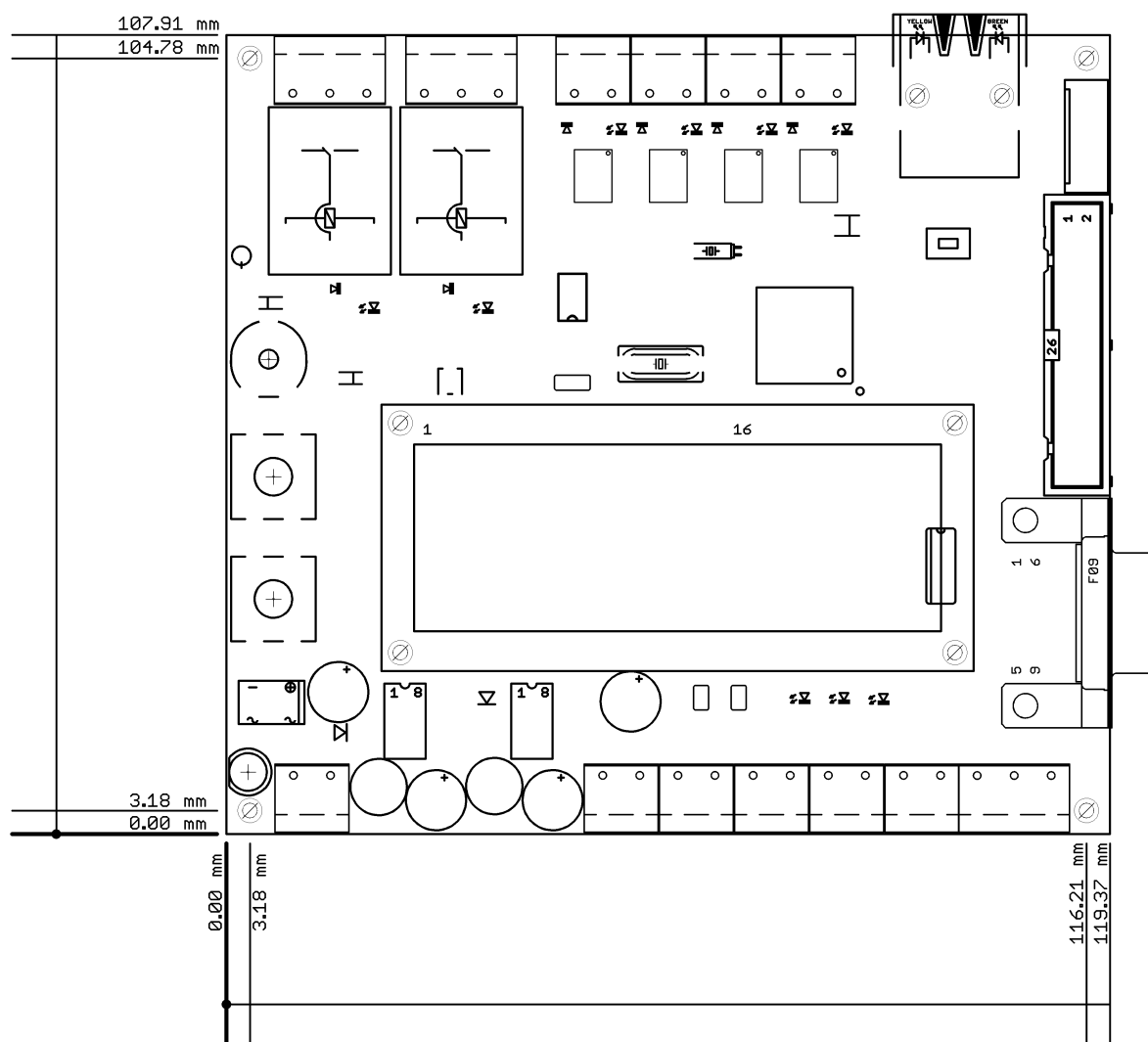
All measures are in mm.

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   - minor mistakes removed for programming tools PIC-MCP