OLIMEX

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PIC-LCD development board _____

Users Manual

INTRODUCTION:

PIC-LCD is simple but powerful board which uses Microchip's PIC18F8490 microcontroller. PIC-LCD is equipped with LCD display, three user buttons, LED, possibility for battery power supply, thermistor and buzzer. This board is excellent for applications in monitoring (temperature measuring) and alarm systems.

BOARD FEATURES:

– MCU: PIC18F8490 with 16KB Flash memory, 768 B RAM memory, LCD driver, 10bit ADC, PWM, SPI, I2C, EUSART, timers, comparators, up to 40 MHz operation
– ICSP connector for PIC-ICD2 debugger or PIC-PGx programmers
– RS232 driver and connector
– Status LED with jumper
– Three user buttons
– Buzzer
– 20 MHz crystal on socket (may be changed to any value by the user)
– 32768 Hz crystal on-board
– On-board thermistor for temperature measurement
– Extension connector for the unused PIC ports
– Backup +4.5 battery connector
– Single power supply: 6 VAC or 9 VDC required (must not exceed 12 VDC or input voltage regulator will be destroyed!)
– PCB: FR-4, 1.5 mm (0.062"), soldermask, silkscreen component print
– Dimensions 72.6 x 64 mm (3 x 2.5")

ELECTROSTATIC WARNING:

The PIC-LCD 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: 1.8 meter USB A-B cable to connect PIC-ICD2 or PIC-ICD2-POCKET to USB host on PC. If you use PIC-PGx, you will need RS232 cable. Other cables might be required in case of other programming/debugging tools.

Hardware: Programmer/Debugger – **PIC-ICD2**, **PIC-ICD2-POCKET, PIC-PGx** 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: **MPLAB IDE (latest version), MPLAB C18 Compiler** or any other compatible development/programming software.
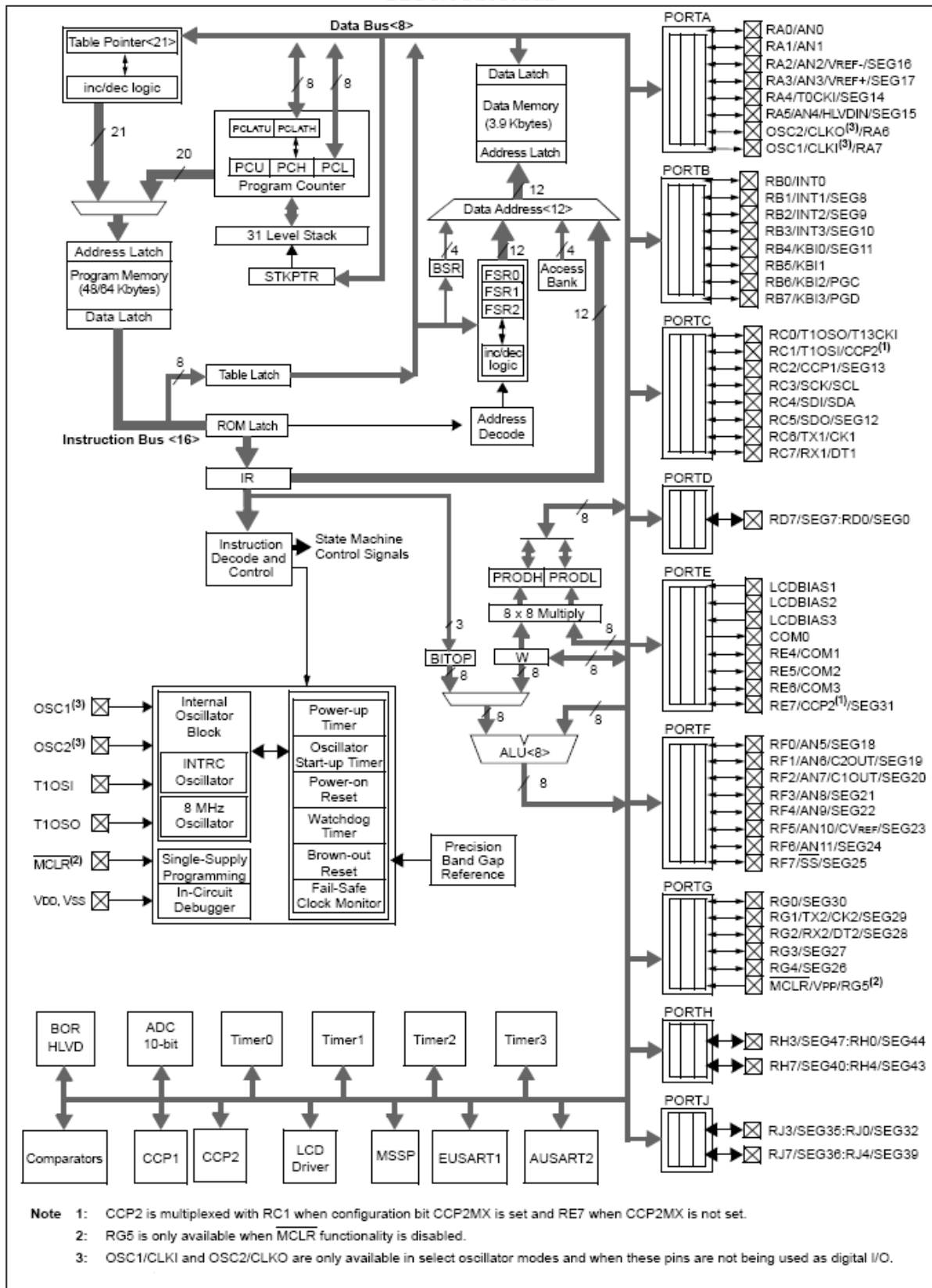
PROCESSOR FEATURES:

PIC-LCD board use MCU **PIC18LF8490** from Microchip with these features:

- Direct driving of LCD panel
- Up to 48 segments: Software Selectable
- Programmable LCD timing module:
    - Multiple LCD timing sources available
    - Up to 4 commons: Static, 1/2, 1/3 or 1/4 multiplex
    - Static, 1/2 or 1/3 bias configuration
- Can drive LCD panel while in Sleep mode
- Power managed modes:
    - Run: CPU on, peripherals on
    - Idle: CPU off, peripherals on
    - Sleep: CPU off, peripherals off
    - Idle mode currents down to 5.8 A typical
    - Sleep current down to 0.1 A typical
    - Timer1 Oscillator: 1.8 A, 32 kHz, 2V
    - Watchdog Timer: 2.1 A
    - Two-Speed Oscillator Start-up
- Four Crystal modes:
    - LP: up to 200 kHz
    - XT: up to 4 MHz
    - HS: up to 40 MHz
    - HSPLL: 4-10 MHz (16-40 MHz internal)
- 4x Phase Lock Loop (available for crystal and internal oscillators)
- Two External RC modes, up to 4 MHz
- Two External Clock modes, up to 40 MHz
- Internal oscillator block:
    - 8 user selectable frequencies, from 31 kHz to 8 MHz
    - Provides a complete range of clock speeds from 31 kHz to 32 MHz when used with PLL
    - User-tunable to compensate for frequency drift
- Secondary oscillator using Timer1 @ 32 kHz
- Fail-Safe Clock Monitor:
    - Allows for safe shut down of device if primary or secondary clock fails
- High current sink/source 25 mA/25 mA
- Four external interrupts
- Four input-change interrupts
- Four 8-bit/16-bit Timer/Counter modules
- Real-Time Clock (RTC) Software module:
    - Configurable 24-hour clock, calendar, automatic 100-year or 12800-year, day-of-week calculator
    - Uses Timer1
- Up to 2 Capture/Compare/PWM (CCP) modules
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI™ (all 4 modes) and I2C™ Master and Slave modes
- Addressable USART module:
    - Supports RS-485 and RS-232
- Enhanced Addressable USART module:
    - Supports RS-485, RS-232 and LIN 1.2
    - Auto-wake-up on Start bit
    - Auto-baud Detect
- 10-bit, up to 12-channel Analog-to-Digital Converter module (A/D):
    - Auto-acquisition capability

- o Conversion available during Sleep
- Dual analog comparators with input multiplexing
- C compiler optimized architecture
    - o Optional extended instruction set designed to optimize re-entrant code
- 1000 erase/write cycle 16 KB Flash program memory typical
- Flash Retention: 100 years typical
- 768 B SRAM
- Priority levels for interrupts
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
    - o Programmable period from 4 ms to 132 s
    - o 2% stability over VDD and temperature
- In-Circuit Serial Programming™ (ICSP™) via two pins
- In-Circuit Debug (ICD) via two pins
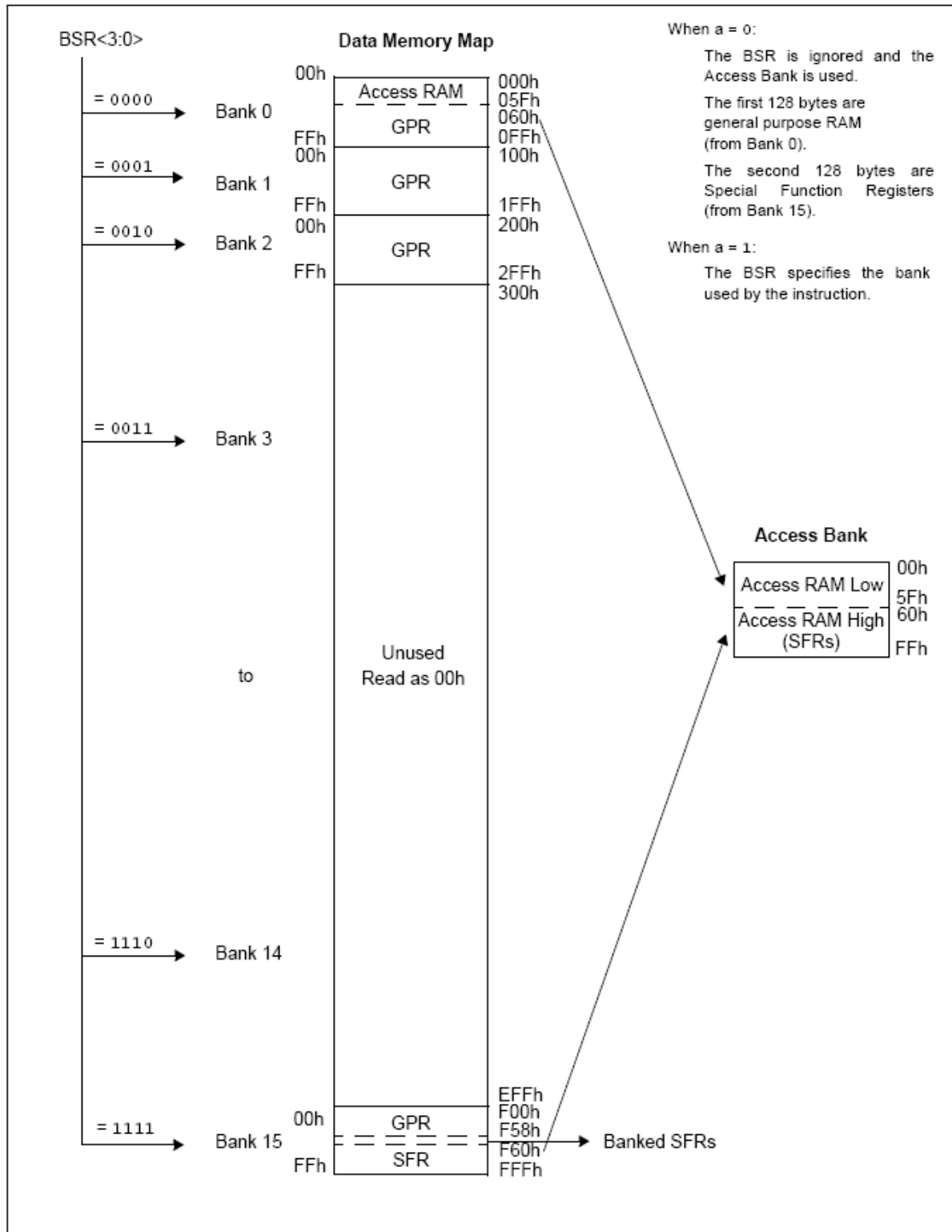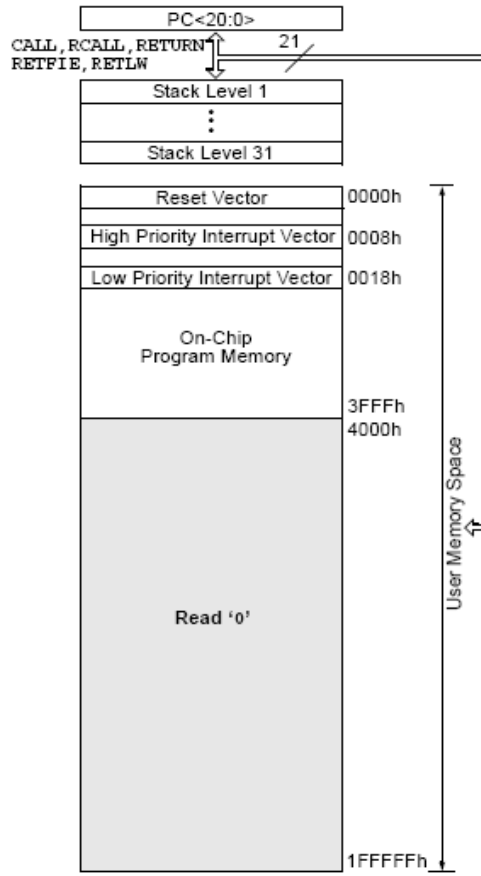- Wide operating voltage range: 2.0V to 5.5V

BLOCK DIAGRAM:

BLOCK DIAGRAM

Note 1: CCP2 is multiplexed with RC1 when configuration bit CCP2MX is set and RE7 when CCP2MX is not set.

2: RG5 is only available when MCLR functionality is disabled.

3: OSC1/CLKI and OSC2/CLKO are only available in select oscillator modes and when these pins are not being used as digital I/O.

MEMORY MAP:

DATA MEMORY MAP FOR PIC18F8490

BSR<3:0>

= 0000 → Bank 0
= 0001 → Bank 1
= 0010 → Bank 2
= 0011 → Bank 3

to

= 1110 → Bank 14
= 1111 → Bank 15

Data Memory Map

Address	Contents
00h–FFh (000h–0FFh)	Access RAM (05Fh) / GPR (060h–0FFh)
00h–FFh (100h–1FFh)	GPR
00h–FFh (200h–2FFh)	GPR
300h–EFFh	Unused Read as 00h
00h–FFh (F00h–FFFh)	GPR (F58h) / SFR (F60h–FFFh) Banked SFRs

Access Bank

Address	Contents
00h–5Fh	Access RAM Low
60h–FFh	Access RAM High (SFRs)

When a = 0:

The BSR is ignored and the Access Bank is used.

The first 128 bytes are general purpose RAM (from Bank 0).

The second 128 bytes are Special Function Registers (from Bank 15).

When a = 1:

The BSR specifies the bank used by the instruction.

PROGRAM MEMORY MAP FOR PIC18F8490

PC<20:0>

CALL , RCALL , RETURN
RETFIE , RETLW

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Stack Level 1
⋮
Stack Level 31

Reset Vector	0000h
High Priority Interrupt Vector	0008h
Low Priority Interrupt Vector	0018h
On-Chip Program Memory	
	3FFFh
	4000h
Read '0'	
	1FFFFFh

User Memory Space

SCHEMATIC:

PIC-LCD REV.D

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http://www.olimex.com/dev
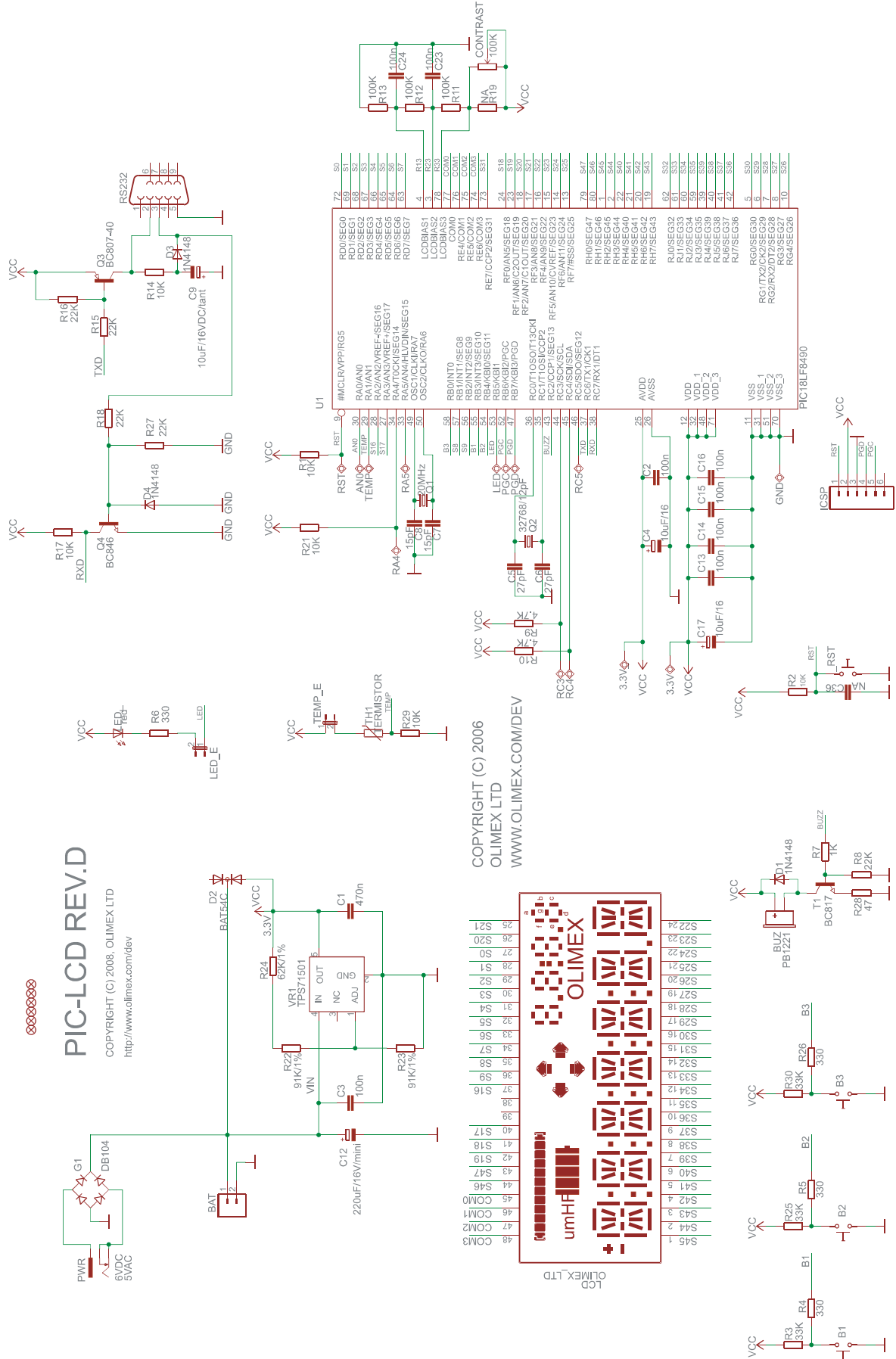
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BOARD LAYOUT:
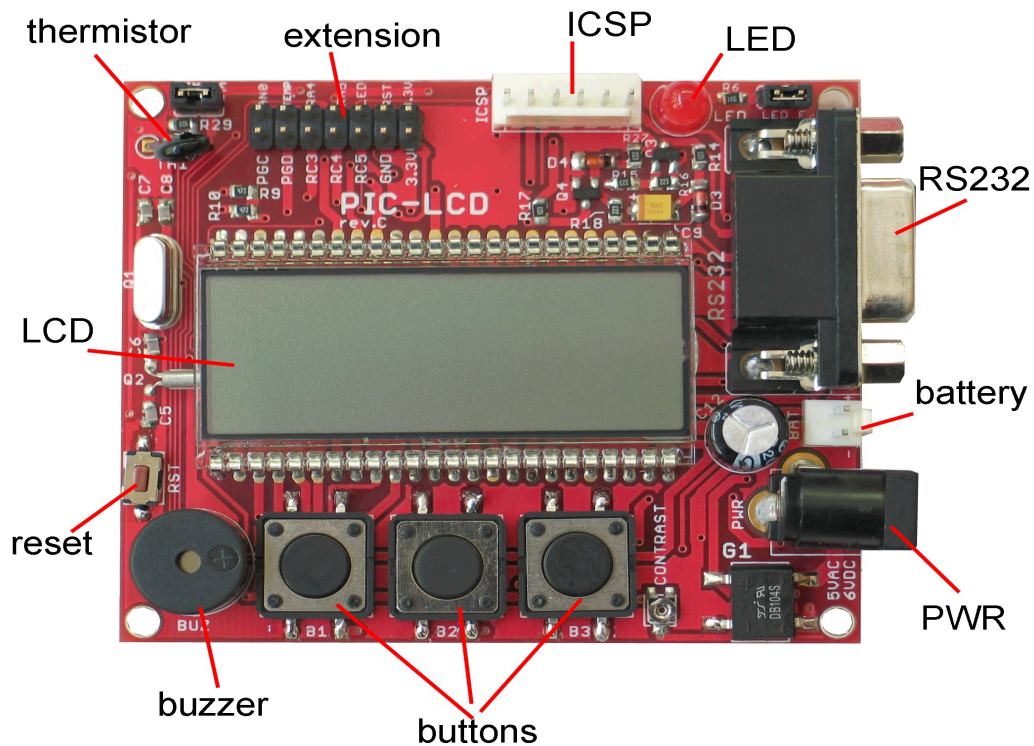
POWER SUPPLY CIRCUIT:

PIC-LCD should be supplied with 6 VAC or +(6-9)VDC. The voltage should not exceed 12 VDC because otherwise the input voltage regulator will be destroyed. The board could also take power from a battery +(4.5-6)VDC.

The board power consumption at 6VDC is up to 10mA.

RESET CIRCUIT:

PIC-LCD reset circuit is realized with a reset button (RST) and the pull-up resistor R2 (10k).

CLOCK CIRCUIT:

Quartz crystal 20 MHz is connected to **PIC18F8490** pin 49   clock in (OSC1/CLKI/RA7) and pin 50 clock out (OSC2/CLKO/RA6).

Quartz crystal 32.768 kHz is connected to **PIC18F8490** pin 35 (RC1/T1OSI/CCP2) and pin 36 (RC0/T1OSO/T13CKI) and supplies the Timer1 which could function as a Real Time Clock.

JUMPER DESCRIPTION:

LED_E

enables the LED to be controlled by the **PIC18F8490**.
<u>Default state is closed.</u>

TEMP_E

enables temperature to be measured by the **PIC18F8490**.
When this   jumper is closed the thermistor is supplied with Vcc voltage.
<u>Default state is closed.</u>

INPUT/OUTPUT:

Status red LED connected to **PIC18F8490** pin 53 (RB5/KBI1).
Thermistor TH1 connected to **PIC18F8490** pin 29 (RA1/AN1).
Trimmer CONTRAST which changes the contrast of the LCD.
Buzzer with name **BUZZ** connected to **PIC18F8490** pin 43
(RC2/CPP1/SEG13).
Reset button with name **RST** connected to **PIC18F8490** pin 9
(#MCLR/VPP/RG5).
User button B1 connected to **PIC18F8490** pin 55 (RB3/INT3/SEG10).
User button B2 connected to **PIC18F8490** pin 54 (RB4/KBI0/SEG11).
User button B3 connected to **PIC18F8490** pin 54 (RB0/INT0).
Liquid crystal display LCD.

EXTERNAL CONNECTORS DESCRIPTION:

ICSP:

Pin #	Signal Name
1	RST
2	+3.3V
3	GND
4	PGD
5	PGC
6	NC
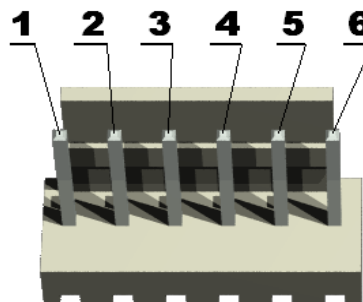
PGD   I/O   **Program Data.** Serial data for programming.
PGC   Input   **Program Clock.** Clock used for transferring the serial data (output from ICSP, input for the MCU).

RS232:

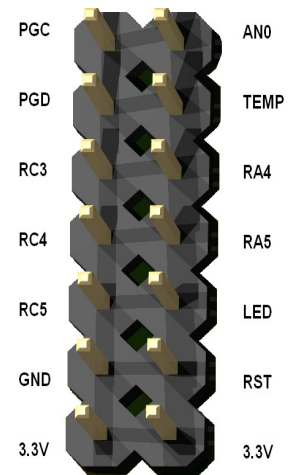| Pin #	Signal Name
1	NC
2	TX
3	RX
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC
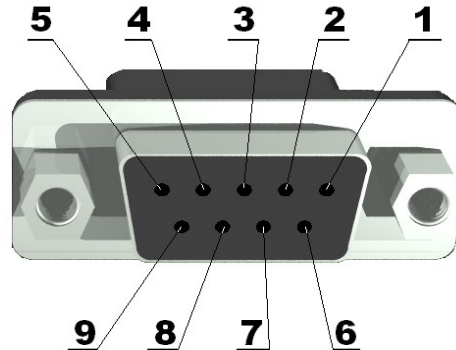
TXD   Output**Transmit Data.** This is the asynchronous serial data output for the RS232 interface.

RXD   Input   **Receive Data.** This is the asynchronous serial data input for the RS232 interface.
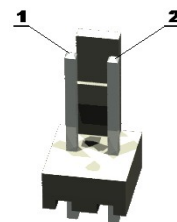
EXT:

Pin #	Signal Name	Pin#	Signal Name
1	PGC	2	AN0
3	PGD	4	TEMP
5	RC3	6	RA4
7	RC4	8	RA5
9	RC5	10	LED
11	GND	12	RST
13	3.3V	14	3.3V

BAT:

Pin #	Signal Name
1	+(4.5-6.0)VDC
2	GND

PWR:

Pin #	Signal Name
1	PWR
2	GND
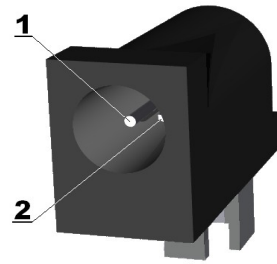
You should apply either 6 VAC or +(6-9) VDC at the PWR pin.

MECHANICAL DIMENSIONS:
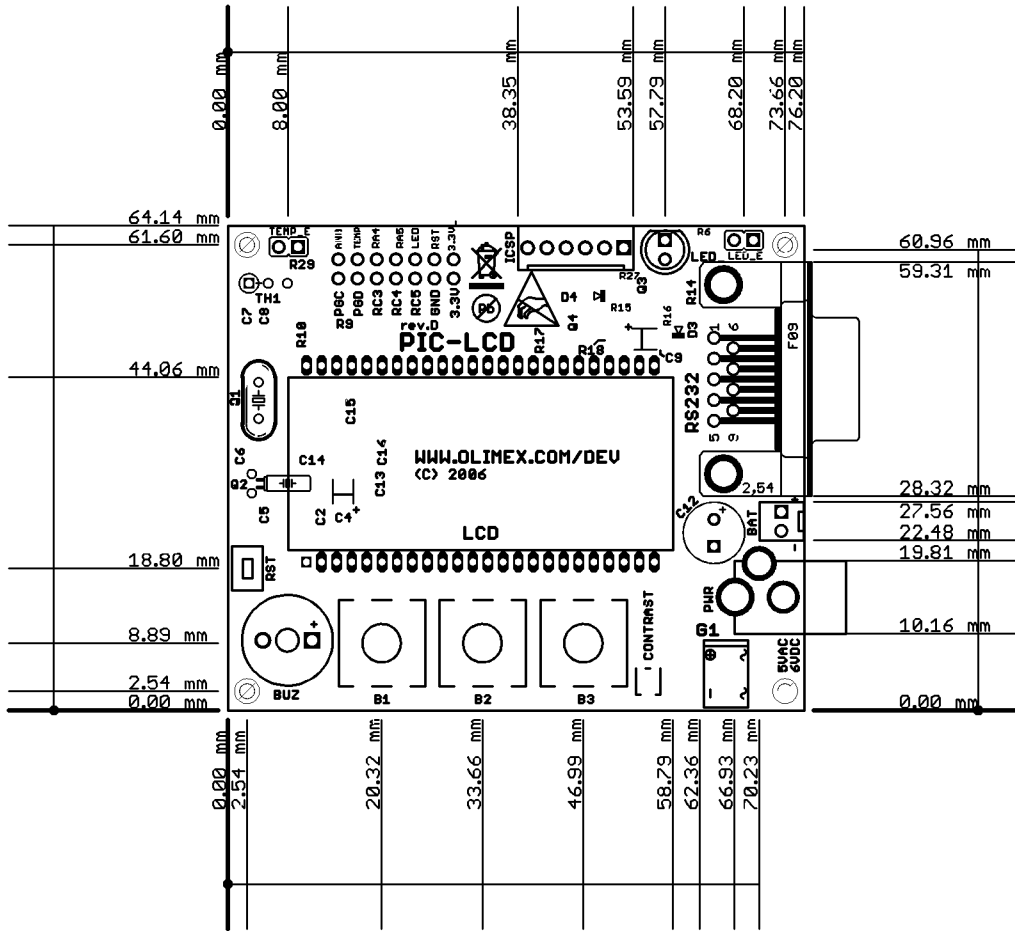
All measures are in mm.

AVAILABLE DEMO SOFTWARE:

You could find information about PIC-LCD demo software at
www.olimex.com/dev.

ORDER CODE:

PIC-LCD – 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   September 2008