Device: PLT-1001

This document Version: 1.0

Date: June 2010

Description: LED Display Panel Driver board

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Introduction

The PLT-1001 is a Microchip PIC18F2620 based driver board designed to drive dynamically-scanned LED panels such as the LDP-6432 and LDP-6416 from Embedded Adventures. Other panels that have similar pin-outs will work as well.

Features

The PLT-1001 features PIC18F2620 clocked at 40Mhz (10mips), a real time clock (RTC) with independent crystal and battery backup, temperature sensor, and the ability to connect an MRF24J40MB IEEE 802.15.4 wireless module.

The PLT-1001 can function as a simple driver board, taking commands from an external microcontroller via TTL-level serial, or can make its own enquiries or take commands over IEEE 802.15.4. It can show the time, date and temperature, display clocks, messages and a range of graphics functions.

Hackability

The PLT-1001 is 100% hackable.

At EA, we believe you have the most fun when you have the most control over your hardware. For the PLT-1001 we provide a datasheet, complete schematic and complete source code. After that, it's all up to you. We'd love to hear about the projects you're using it for – send us information and photos to myproject@embeddedadventures.com

Construction

Please see the "Building Kits" section under Tutorials on the EA web site – www.embeddedadventures.com

Connections

The PLT-1001 has three connection ports.

SERIAL	TTL level serial port
ICSP	Programming port for PIC
LEDPANEL	16 pin connection to LED display panel

Power

The PLT-1001 provides a terminal block for power input and two terminal blocks for connection to your LED display panel(s). The PLT-1001 is designed to run at 5v. Note that running large quantities of LEDs can result in a voltage drop across the supply, which may affect the reliability of the microcontroller. See the datasheet for your LED display.

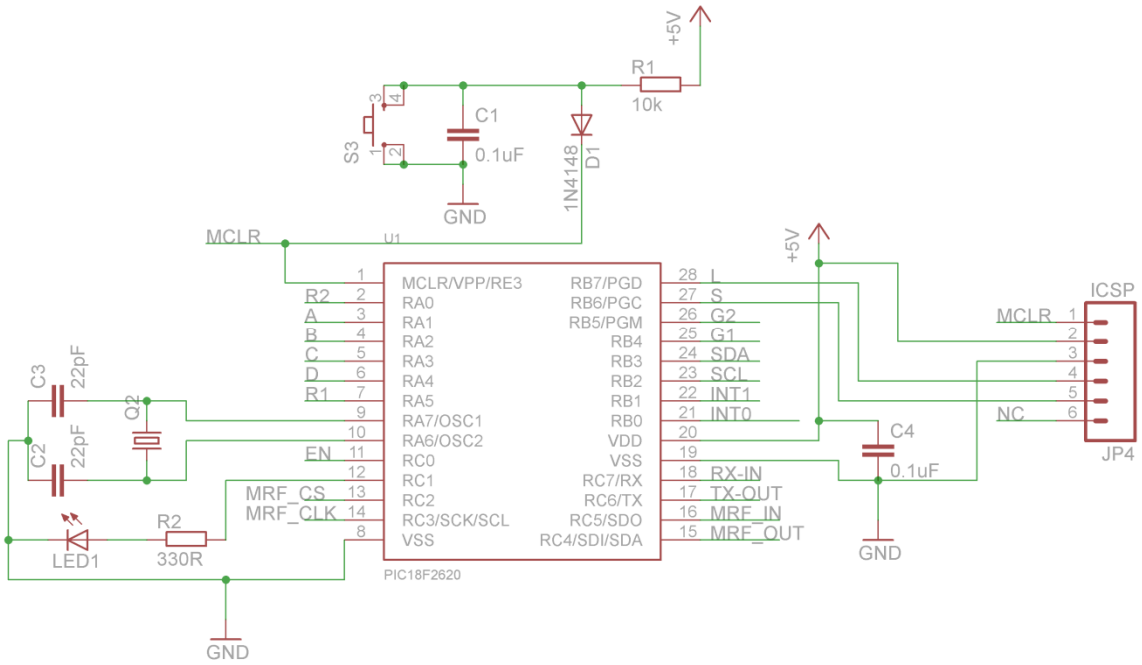
Note that the current version of the LDP-6432 has an error on the PCB. The PCB trace between the power input terminal and the LED Display power terminals is insufficiently large to carry more than 1 Amp. As such it is necessary to ensure that the connection between your LED panel and your power supply is capable of carrying the current that will be required. A fully lit 64x16 panel will consume up to 4 Amps given the chance. A short wire of AWG 15, or greater, between the power input terminal and the LED Display power terminals will be sufficient.

Buttons

The PLT-1001 has one button connected to RE3 (MCLR). This allows it to function as a reset button, which is great during development. During deployment, however, you may find that it is more useful to actually have a functioning push button. In this case, you will need to change the config fuses so that the pin functions as RE3 and not MCLR. Please see the PIC18F1620 datasheet for more information.

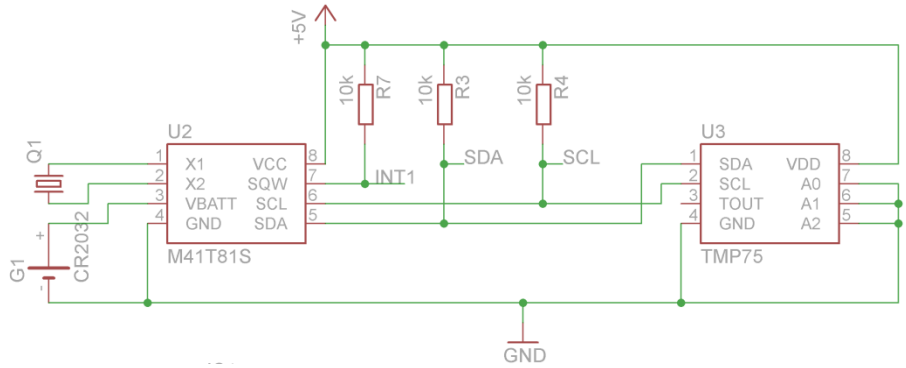
Schematic

Microcontroller



The microcontroller circuitry is fairly standard. A reset button is provided as S3, which pulls MCLR to ground. C1 prevents debounce noise. D1 prevents programming voltages on MCLR/VPP reaching the +5V buss. C2, C3 and crystal Q3 allow the PIC to run at 10mips. LED1 is available by pulling RC1 high; it is used by the 18f2620_10Mhz_40Mhz_PLL_CLK version of Boostbloader to indicate the bootloader is alive and well. C4 is a power supply bypass for the PIC and JP provides an ICSP connection for reprogramming the PIC without a bootloader (or to flash a new bootloader).

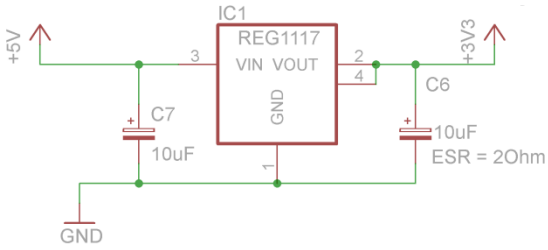
Real Time Clock (RTC) and Temperature Sensor



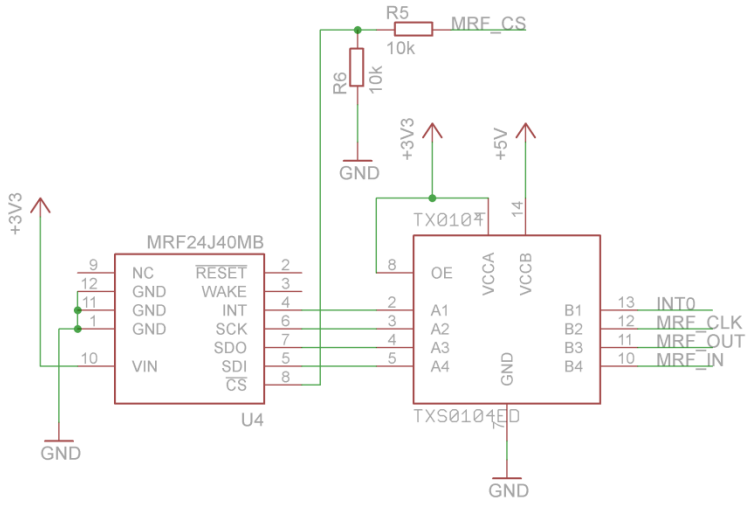
The RTC used on the PLT-1001 board is the ST M41T81S. It's a great chip that has plenty of features worth playing with, including an alarm function. The SQW output is connected to RB1 (INT1) and can be used as an interrupt source. A CR2032

battery powers the M41T81S when main power is removed. This should keep the RTC powered for the lifetime of the universe or about 10 years, whichever occurs first. The RTC is clocked by a 32.768Khz crystal (Q1). The TMP75 is a good value temperature sensor, and while it's not the most accurate chip available, it does a perfectly sufficient job for displaying the local temperature on your LED Display. The TMP75 and M41T81S are connected to the same i^2c buss, which is available on pins RB3 (SDA) and RB2 (SCL).

MRF24J40MB

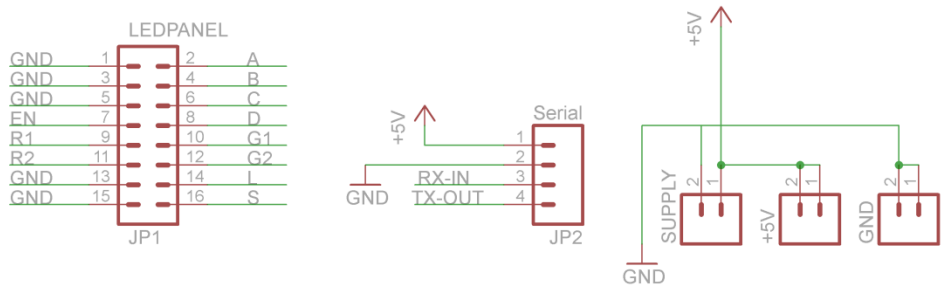


The 1117 regulator and associated capacitors C7 and C6 provide a 3.3v supply for the MRF24J40MB.



The board runs at 5v, so the MRF24J40MB requires voltage translation to 3.3v. Here the TXS0104ED is used. It seamlessly translates voltages both ways automatically. In this case we are one pin short – so the $\overline{CS}$ pin uses a voltage divider to bring 5v down to 3.3v – still within spec.

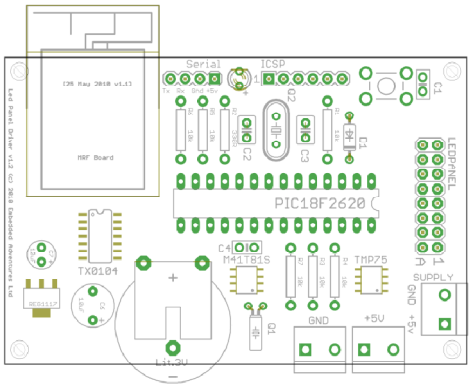
Other connections



The only remaining parts to the schematic are the connections to the LED Display Panel itself, the Serial connection, and the terminal blocks used to power the board and the LED Panel.

Note that the Serial connection is TTL, and is marked in reference to this board – so RX-IN means data coming into the board. If you are connecting to a USB to Async TTL interface board, for example, you will need to connect RX-IN to TX on your interface board (and TX-OUT to RX). Ground and +5v are supplied as well but may not be necessary.

PCB



The board is designed to allow you to construct the entire project by hand soldering. Even the surface mount parts are not difficult. Please see the "Building Kits" section under Tutorials on the EA web site – www.embeddedadventures.com – for more information.

Versions

Version	Date	Comments
Version 1.0	9 June 2010	Initial Version for board v1.2