Getting Started with PIC24F/PIC24H Programming and Interfacing in 'C'

This series of short articles covers the basics of programming a PIC24FJ32GA002/PIC24H 16-bit microcontroller, using Microchip's free C30 compiler. These articles assume a very basic understanding of Microchip microcontrollers and development tools, especially MPLAB IDE.

A number of projects will be presented, which are based upon using a low cost PIC24F/H board as the main platform, Microchip's free C30 C compiler, and a low cost PICKIT2 (or PICKIT3) used for programming and debugging function.

Project 0

Building the Laboratory Board

Introduction

In this article the tools (software and hardware) needed for experimentation with PIC24F (and PIC24H) microcontroller are discussed. The discussion will include the description of the PIC24F/H board, its general specifications, and populating the PIC24 PC board with minimal hardware necessary for getting started in PIC24 programming.
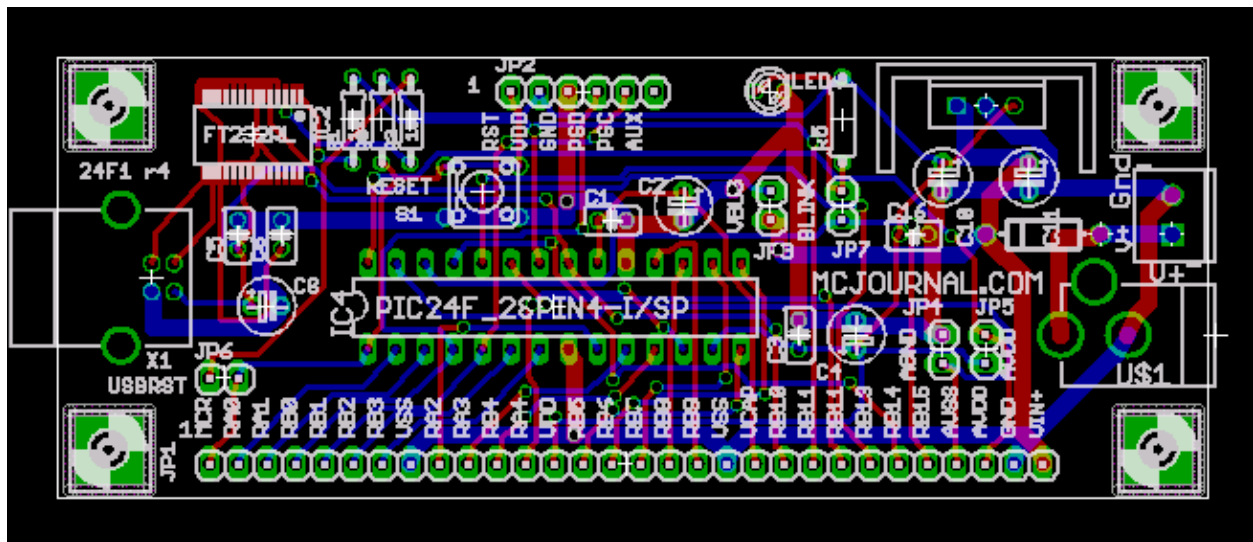

Figure 1 PIC24 Board Layout

The PIC24F/H Board

Figure 1 shows the layout of the board. The board has been designed to provide a low cost platform that can accommodate 28-pin version of various PIC24F and PIC24H series of microcontrollers and allows the use of breadboard for interfacing. At the same time, the board can be used in a turnkey application with suitable external interfaces. The board is available in various versions:

- Bare pc board
- Minimum kit – pc board, 28-pin socket, 30 pin male header, 6-pin PICKIT2/3 header, capacitors
- Full kit
- Partially assembled - minimum kit version

The board capabilities are discussed as follows:

Interface Connector

Every single pin of 28-pin PIC24F/H microcontroller is brought to a 30 pin header, along with connections for an external power. With a 30-pin male header soldered, the board can be inserted in a standard breadboard, exposing all connections for interfacing, while enjoying the convenience of a bread board.
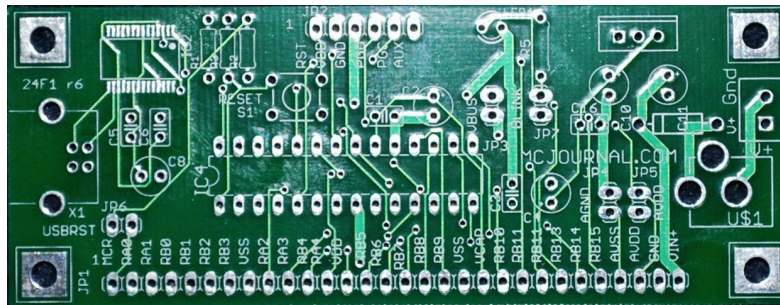

Figure 2 PIC24 Bare Board

Voltage Input Stage

The voltage can be applied either through a barrel connector using DC adapter (5 to 9 VDC) or a through a 2-pin screw terminal connector. In this case, 3.3V voltage regulator circuit (on-board) will need to be populated. During the develop stage, the board can be simply be powered through PICKIT2/3.

PICKIT 2/3 header

For interface to Microchip's low cost PICKIT 2/3A debugger and Programmer a 6-pin header can be installed.

Power-on LED

A LED with associated current limiting LED can be installed to provide a visual indication of power.

AVSS and AVDD Jumpers

Some versions of PIC24 contain AVDD and AVSS (AGND) pins for using external precision power supply for A/D Converter, while in some other devices, these pins are supposed to be connected to digital VSS and VDD supply. This can be managed by two jumpers that can be closed for using digital VSS and VDD and left open for using an external voltage source

Reset Switch

A reset switch S1 is available for use, when using the board in a target application. It is not recommended to use a reset switch, while the PICKIT 2/3 is interfaced to the board.
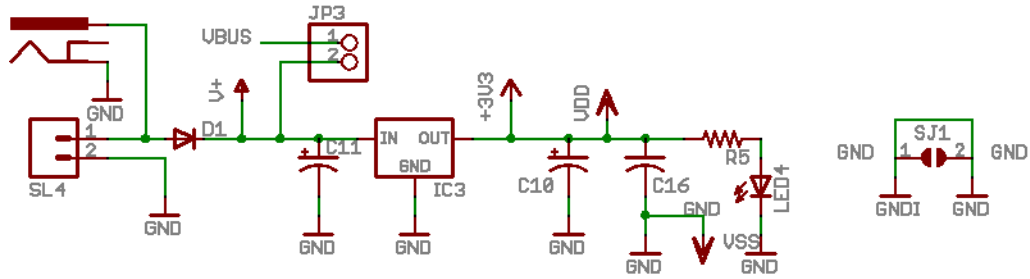
Figure 3 PIC24 Board Power Supply

The Schematic Diagram

The schematics of the board are shown in Figure 3 and 4. Figure 3 shows the supply input section using either the barrel connector or the terminal. LED1 and R5, if populated, provide a visual indication of the board power up status.

Figure 4 shows the interface between the PIC24 microcontroller and the interface connector.
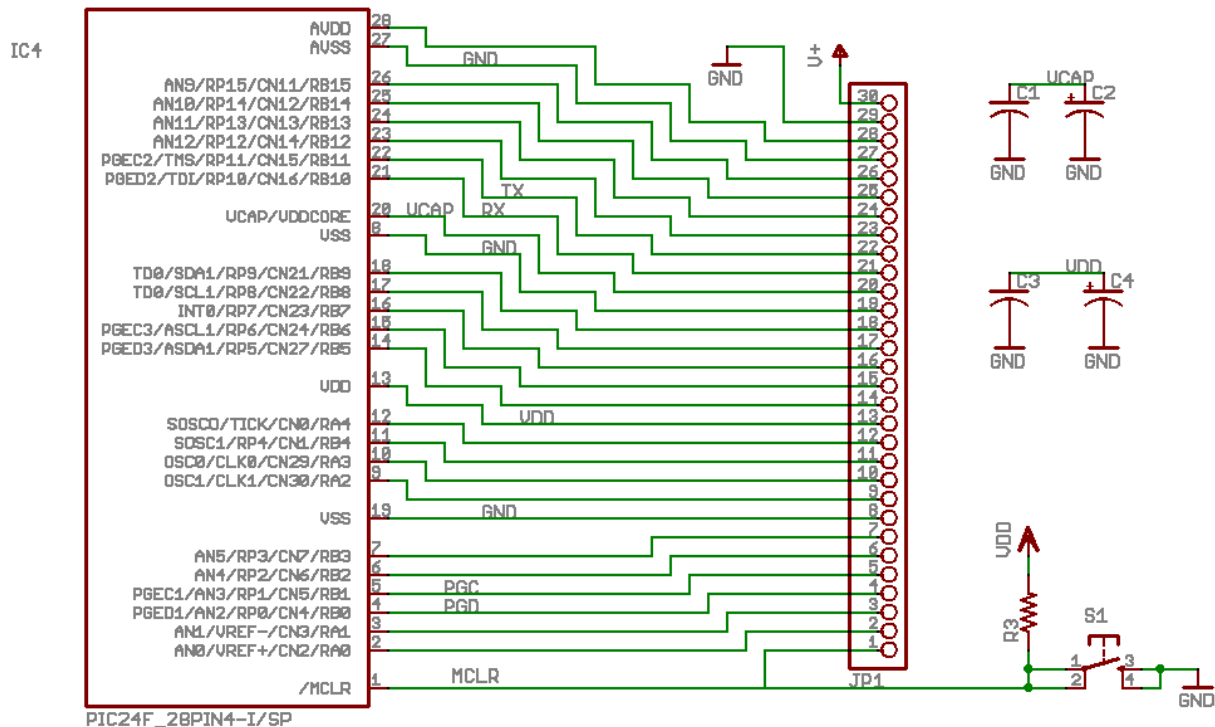

Figure 4 PIC24 Board MCU and Interface Connector

Preparing the Minimal System

For a bare minimum configuration and using the following are essential.

- **PICKIT 2/3**

  PICKIT 2 or PICKIT 3 is a very affordable Debugging and Programming tool that works seamlessly with MPLAB and various programming language suites that can be used with it. It can also be used with other devices from Microchip, e.g. PIC16, PIC18, PIC24, and PIC32, to name a few. It is possible to use the board with a bootloader, but that is something which does not pay off in the long run and is not being recommended here.

- **Computer with MPLAB and C30**

  MPLAB and C30 can be freely downloaded from Microchip's website (www.microchip.com). The free version of C30 is practically same as the full blown version and the main difference lies in the lack of some of the optimizations that are only available in commercial version. In any case, on a new download, the full commercial version is made available for 60 days, after which the optimizations become ineffective.

- **Minimally populated PIC24 board**

  The minimally populated board will consist of PIC24 microcontroller, 4 capacitors, and 6 pin PICKIT 2/3 header. It is highly recommended to use a 28 pin (narrow) socket so that different versions of PIC24 microcontrollers (PIC24F and/or PIC24H) may be used. For interfacing a 30 pin male/female header will prove to be indispensible. A diagram of the minimally populated board with female header is shown below. Any suitable PIC24 microcontroller can be installed in the 28-pin socket.
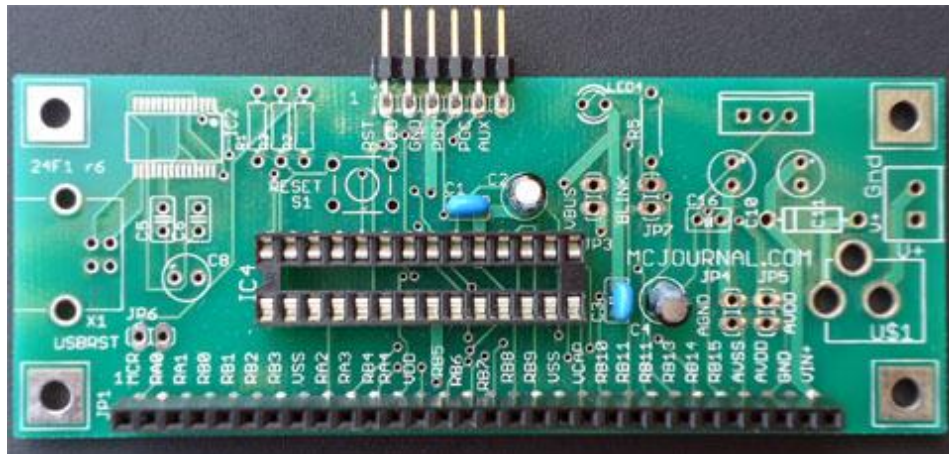

Figure 5 PIC24 Minimally Populated Board with Female Header

Next Time

Armed with the laboratory board, fun with PIC24 microcontroller can now begin. The next project will see a 'Hello LED' (equivalent to ubiquitous 'Hello World') program being developed and run on the PIC24 board.