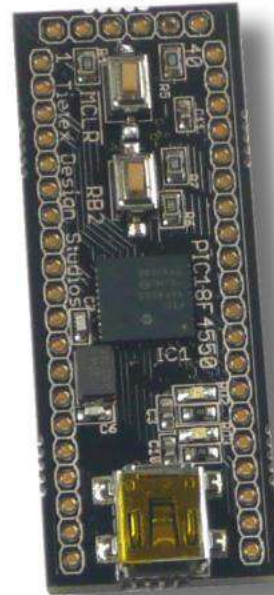


exul4550MINI development board

Features

- Full development board in the same physical size as a PIC18F4550 chip
- Inexpensive development board providing an easy and quick start to your project
- A USB mini-B socket to provide power and USB connectivity for both the built-in bootloader and your projects
- A 40-pin board with the same pin-outs, physical size and pitch as a PIC18F4550 PDIP device
- An ICSP header for connection to a PICKit 2/PICKit 3 or similar device
- 0.1" pitch pins with a 0.6" separation between the rows for easy stripboard and breadboard mounting
- On-board 20MHz crystal – allowing for full 48MHz and USB 2 operation
- 2 LEDs on-board connected to RD2 and RD3
- 2 push buttons – one for MCLR/Reset and one attached to RB2
- Tiny footprint: 56x20mm
- Compatible with Microchip's PIC18F4550 bootloader – comes preloaded with a customised version supporting the on-chip buttons and LEDs



Description

The exul4550MINI is an all in one USB development board incorporating the Microchip PIC18F4550 microcontroller with 32KB of flash, 2048 bytes of RAM and a variety of onboard interfaces and modules.

The board is the same size and pin-out as a PIC18F4550 DIP device allowing for rapid development and easy replacement with a PIC18F4550 DIP chip once your development is complete.

Table of Contents

Features	1
Description.....	1
Pin Diagram	3
Electrical Characteristics	3
Power requirements	3
On-board Features.....	4
PIC18F4550 Specifications	4
System Clock.....	4
In-Circuit Programming.....	5
On-board I/O	5
Bootloader	5
Schematic	6
Getting started.....	7
Installing Java	7
Installing the MPLAB X integrated development environment.....	7
HID Bootloader application.....	7
Test code sample	7
Loading the sample into the PIC	9
Using the board with a PICKit2 or PICKit3 programmer	12

Legal Information

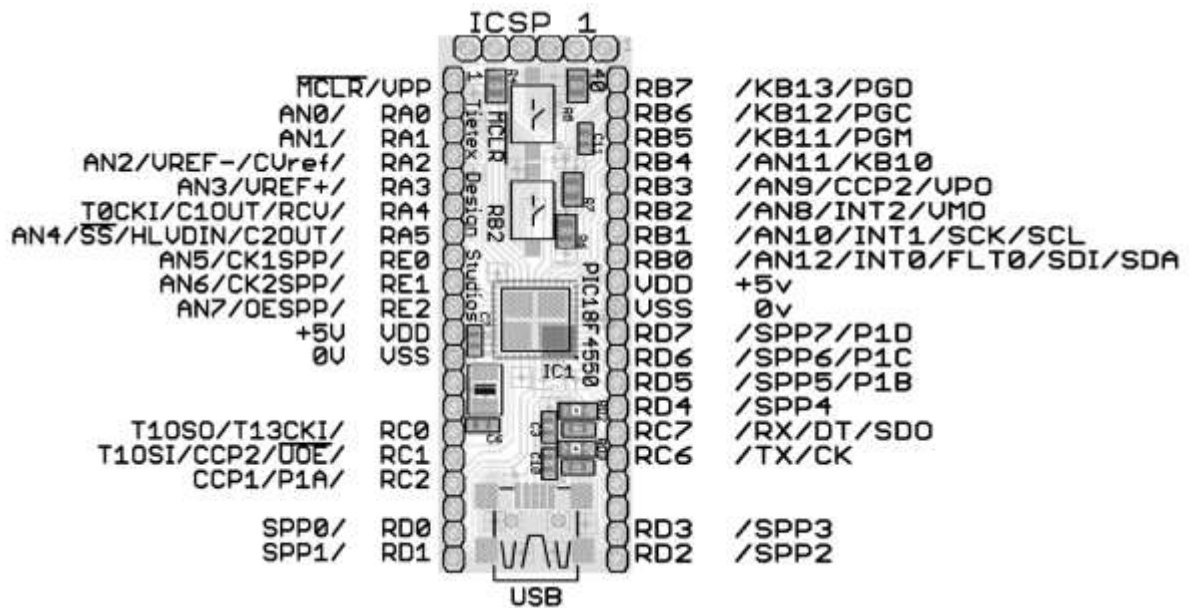
This board is designed purely to be used as an engineering demonstration, development and evaluation board and not for commercial or consumer use. It is intended that the board is for use by competent persons such as electronic and software engineers or students.

Due to the nature and open ended uses of development boards in general, we cannot accept responsibility for damage arising to the board or connected equipment in any circumstance.

Any software tools, software demonstrations, or technical advice supplied in relation to this board is given freely but without warranty. Any information, including this datasheet, is provided for your convenience only and is supplied without any warranties.

We cannot be held responsible for any damages or consequential losses with regards to this product, information or support.

Pin Diagram



Board dimensions are 20x56mm. Pin pitch is 0.1" or 2.54mm.

Electrical Characteristics

Parameter	Minimum	Typical	Maximum
Input Voltage	4.5V	5.0V	5.5V
Current Requirement	5mA	Varies depending on your application	500mA (max allowable under USB specification)

Electrical characteristics are correct at 25°C.

Power requirements

The board can be powered from a variety of sources:

1. USB socket – via power from a USB host or USB charger/power adaptor
2. 5V supplied to pin 10 and/or 32, ground connected to pin 12 and/or 31
3. 5V supplied via the ICSP connector

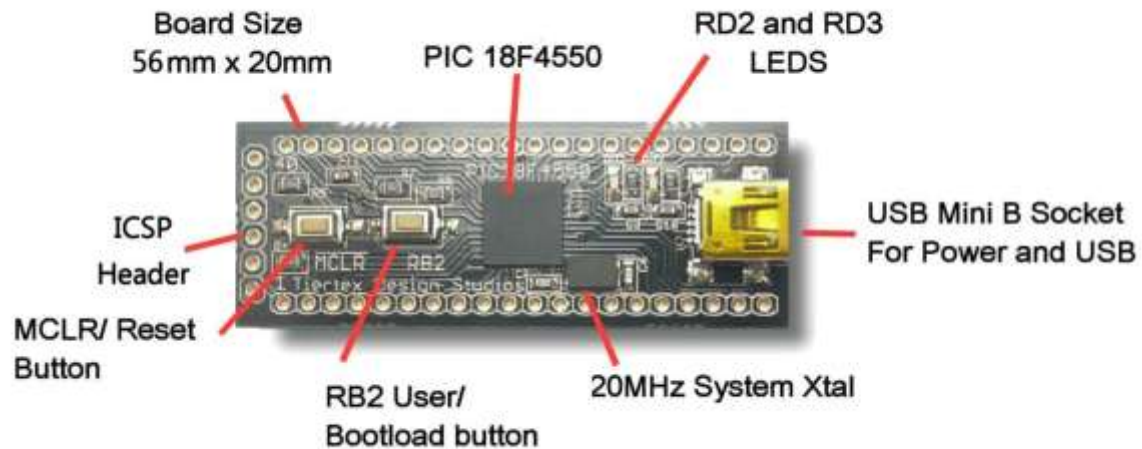
It is strongly recommended that only a single method is used to power the board at any one time.

The 5V supply from the USB connector is unprotected so care must be taken to avoid damage to the PIC board, the USB host or power adaptor, and other devices.

If a PICkit 2 or similar in-circuit programmer is in use while the USB cable is connected, please switch off the V_{DD} on the PICkit so that power is drawn solely from the USB connector.

It is the user's responsibility to ensure safe and correct connection of this board to a power supply.

On-board Features



PIC18F4550 Specifications

The PIC18F4550 includes a wide range of functionality:

- 32 kilobytes of Flash memory for program storage
- 2048 bytes of RAM
- Three external interrupts
- Master Synchronous Serial Port (MSSP) module supporting SPI and I²C
- 4 timer modules
- 2x Capture/Compare/PWM (CCP) modules and an enhanced Capture/Compare/PWM module (ECCP) with multiple output modes, selectable polarity, programmable dead time, auto-shutdown and auto-restart
- Enhanced USART module
- 10-bit, up to 13 channel Analog to Digital converter

For more information see the Microchip datasheet:

<http://ww1.microchip.com/downloads/en/devicedoc/39632e.pdf>

System Clock

An onboard 20MHz crystal is used to provide the system clock – allowing full 48MHz and USB2.0 operation.

In-Circuit Programming

There is an ICSP header provided on the board. The ICSP header is PICkit2 and PICkit3 compatible and the pinout is as follows:

ICSP Connector	Description	Connected to
Pin 1	MCLR	PIC pin 1
Pin 2	5V	PIC pins 11 and 32
Pin 3	GND	PIC pins 12 and 31
Pin 4	PGD	PIC pin 40
Pin 5	PGC	PIC pin 39
Pin 6	AUX	Not connected

On-board I/O

Pin RB2 is wired to a tactile switch for input. This pin can be safely reconfigured for other functionality. A tactile switch is also provided for MCLR/Reset.

RD2 and RD3 are connected to on-board LEDs and are not connected to the external headers.

Bootloader

Microchip's PIC18F4550 HID bootloader is preinstalled allowing easy software development using only USB connection.

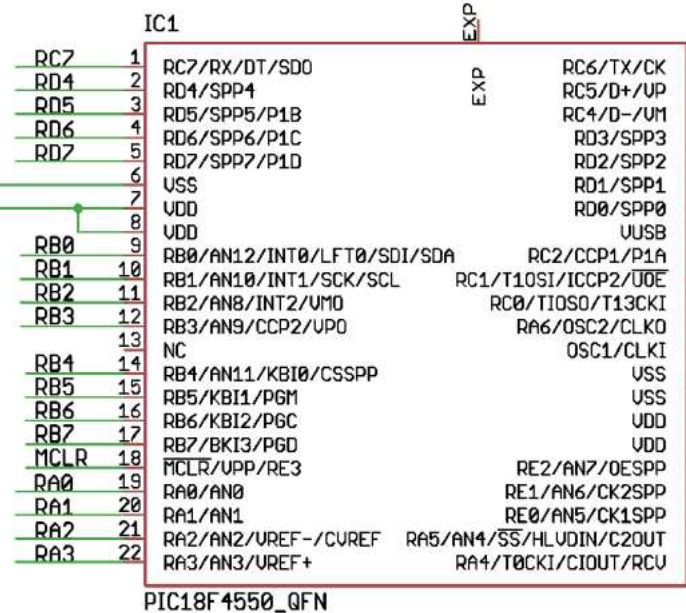
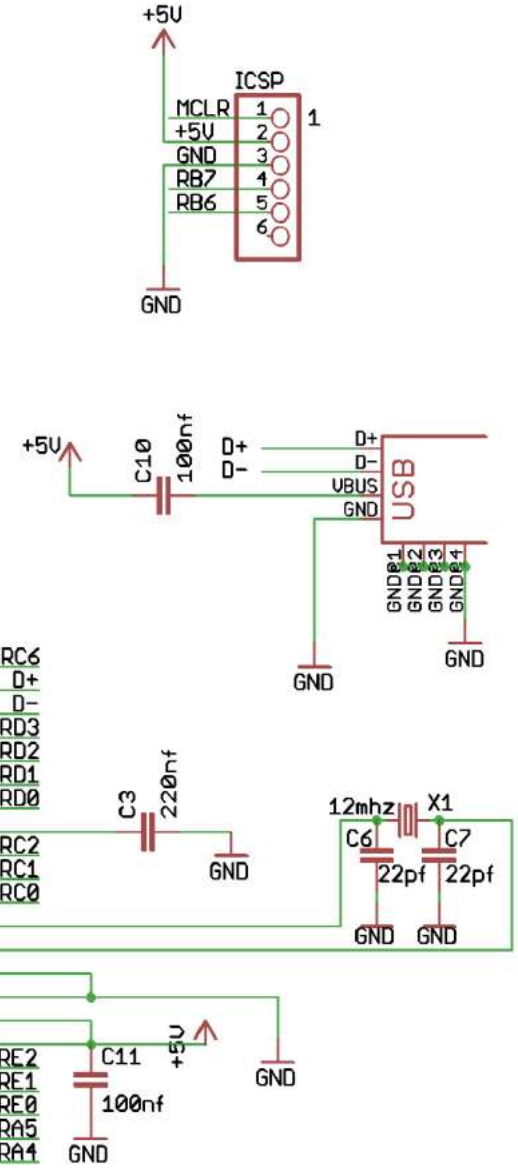
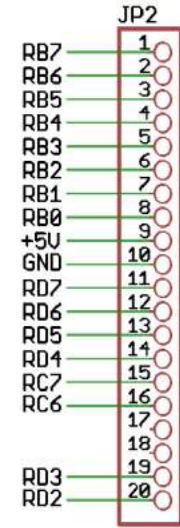
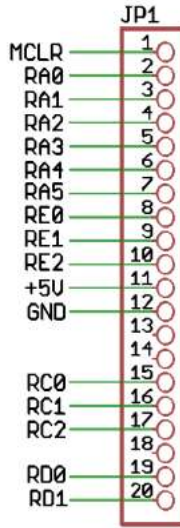
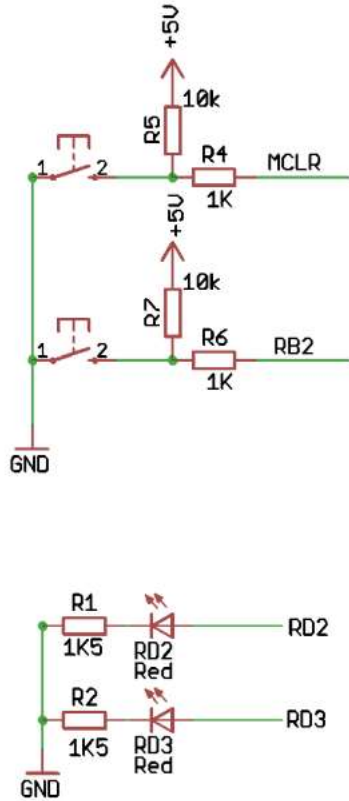
The bootloader occupies 4K out of the available 32K program space. No drivers are required for the USB connection as it functions through a standard USB HID interface. The USB bootloader application is available for download from our download area.

To enter the bootloader, hold down the RB2 button when either when inserting a USB cable or while pressing MCLR. The RD2 and RD3 LEDs will flash alternately once connection to a PC is established.

Code written for use with the bootloader should be set to execute from 0x1000 and place the high interrupt handler at 0x1008 and low interrupt handler at 0x1018. The configuration registers are already preset and should not be reassigned. Changing the configuration registers is likely to prevent the correct operation of the bootloader and may require a reflash of the bootloader to correct.

If you corrupt your bootloader and need to reflash it, it can be downloaded from <http://buyhere22.com/pic/downloads/18F4550%20Bootloader.zip>. Flashing this file will require a separate PIC programmer such as a PICkit2 or PICkit3.

Schematic



Getting started

This section shows all the steps necessary to get started with your new development board.

It will walk you through installing the Microchip IDE, C compiler and bootloader software. It will go on to show you how to compile and download a sample application on to the development board.

These instructions were tested with version 1.10 of MPLAB X, and version 3.40 of the MPLAB C for PIC18 compiler.

Installing Java

You will need the latest version of the Java 6 runtime environment. Download and install this from <http://www.java.com/en/download/>.

Installing the MPLAB X integrated development environment

The MPLAB X IDE can be downloaded from <http://www.microchip.com/mplabx>. Click on the “Free Download” button and then tick the checkboxes labelled “MPLAB IDE X” and “MPLAB C18 Lite Compiler for PIC18 MCUs” and then click “Download Now”.

This will start the download of the necessary files.

Once the two files have finished downloading, install the MPLAB X application first from the downloaded file labelled “mplabx-ide-v1.10-windows-installer.exe”.

Once this has finished, install the MPLAB C18 Compiler from the file labelled “mplabc18-v3.40-windows-lite-installer.exe”.

HID Bootloader application

The development board has a bootloader preloaded to allow easy programming of the device without the need to PIC programming hardware. This bootloader uses a USB connection and a special application on the PC to program code on to the PIC.

The latest version of the bootloader application for Windows can be downloaded at:

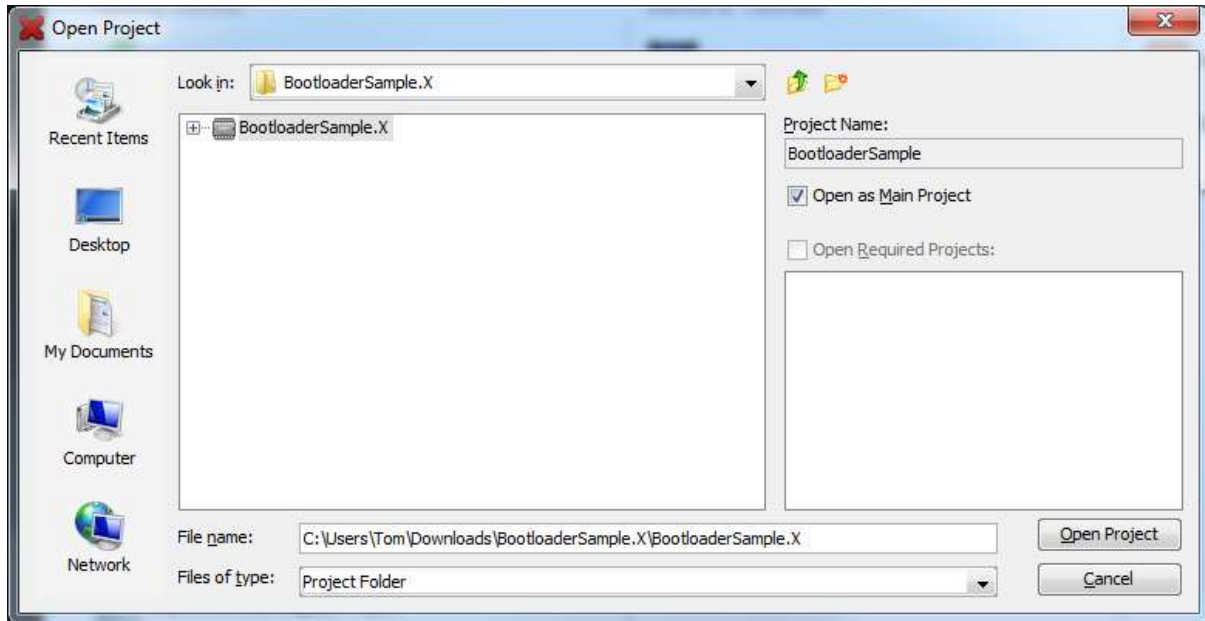
[http://buyhere22.com/pic/downloads/HIDBootloader%20\(Windows\).zip](http://buyhere22.com/pic/downloads/HIDBootloader%20(Windows).zip)

Test code sample

The test sample can be downloaded from

<http://buyhere22.com/pic/downloads/BootloaderSample.X.zip>. Extract this and open MPLAB X.

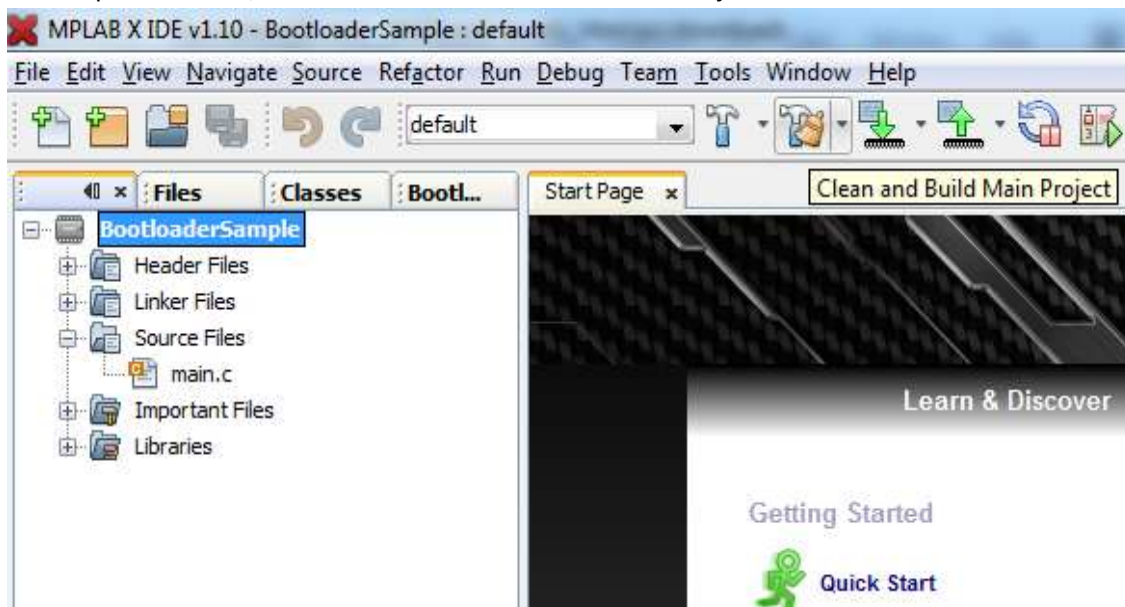
In MPLAB X, go to File, Open Project.



Browse to the downloaded project and click “Open Project” to load the project into MPLAB X.

This project consists of two files – “main.c” and “18f4550.lkr”. “main.c” is the source code for the project and the “18f4550.lkr” file is a linker file that forces the compiler not to produce any output before 0x1000, as the section from 0x0000 to 0x0FFF is used by the bootloader.

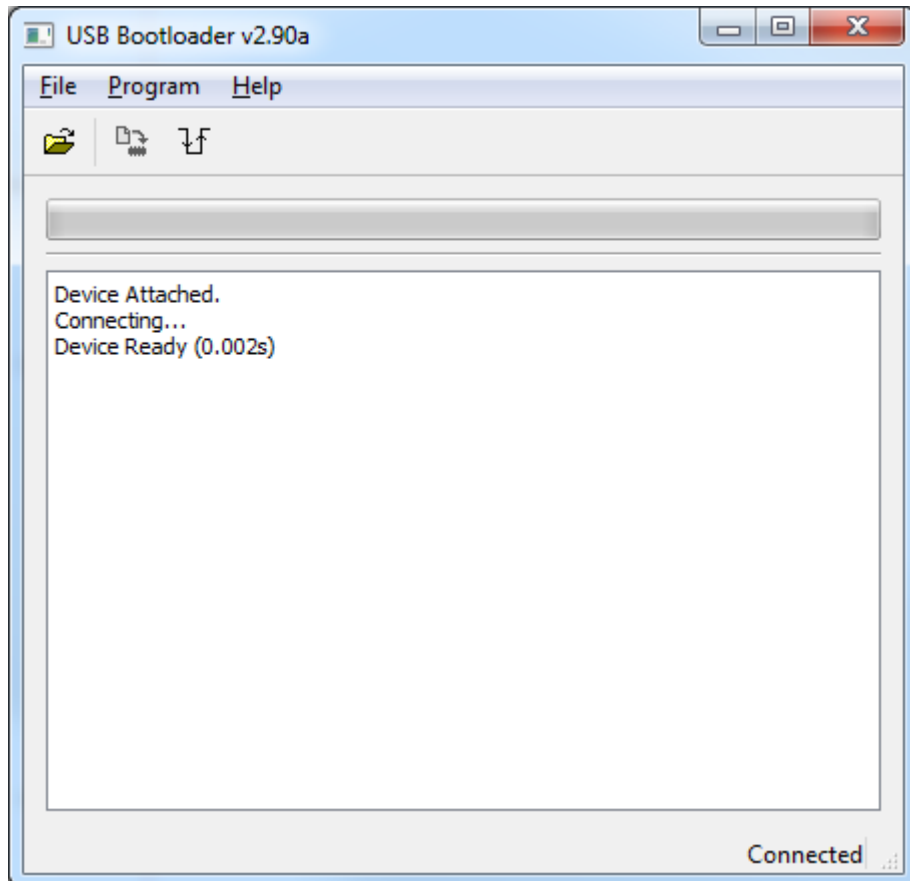
To compile the code, click on the “Clean and Build Main Project” button.



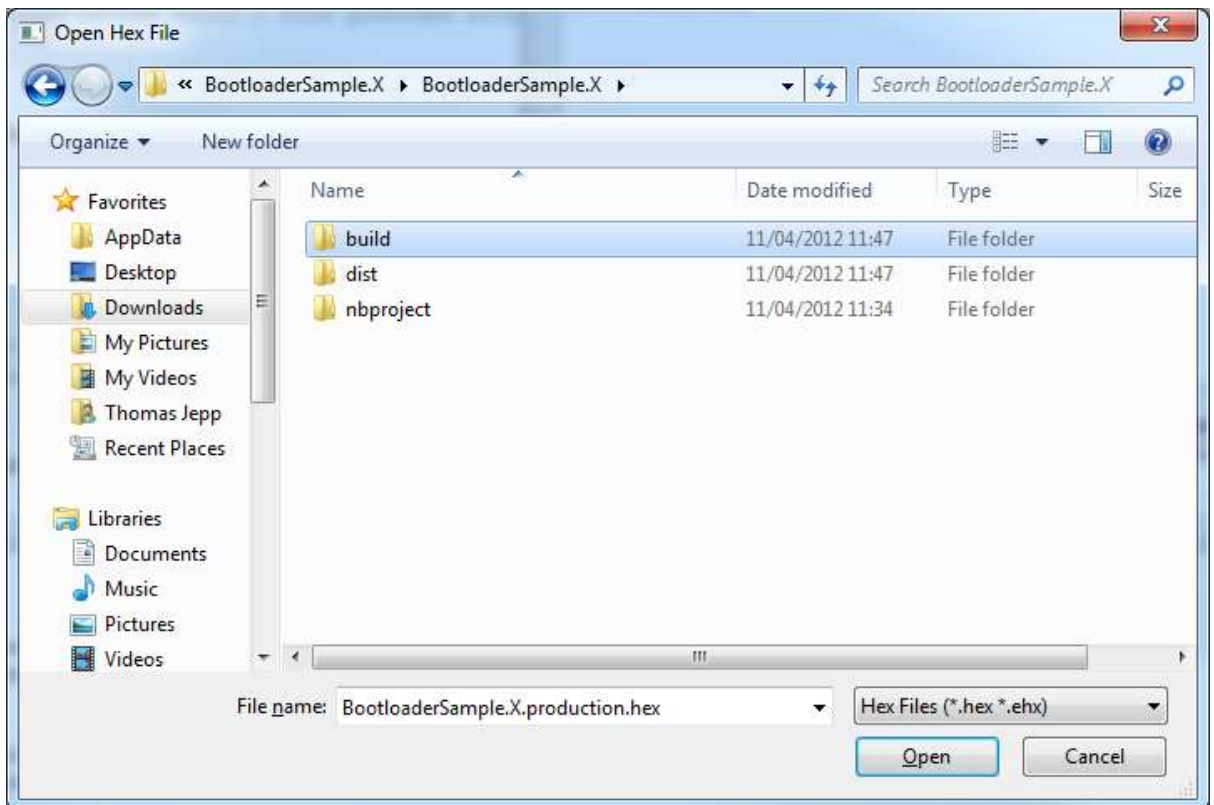
The code should now be compiled and ready to load on to the PIC.

Loading the sample into the PIC

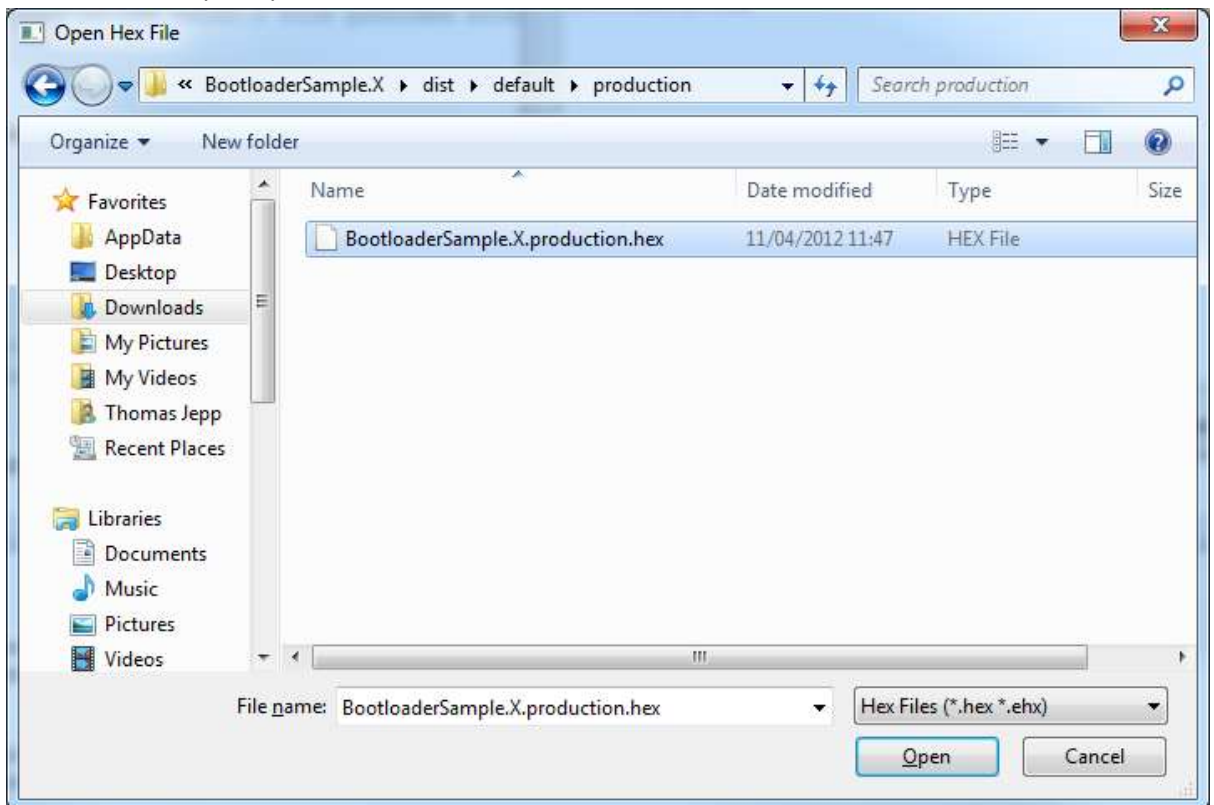
1. Download the HID Bootloader application as mentioned above and extract it.
2. Plug the PIC into the PC using the USB cable provided.
3. We must first reset the PIC and ensure it is ready to receive our code. Hold the RB2 button, and then press MCLR. The two LEDs on the development board should start to quickly flash alternately.
4. Start the HID Bootloader application. You should see:



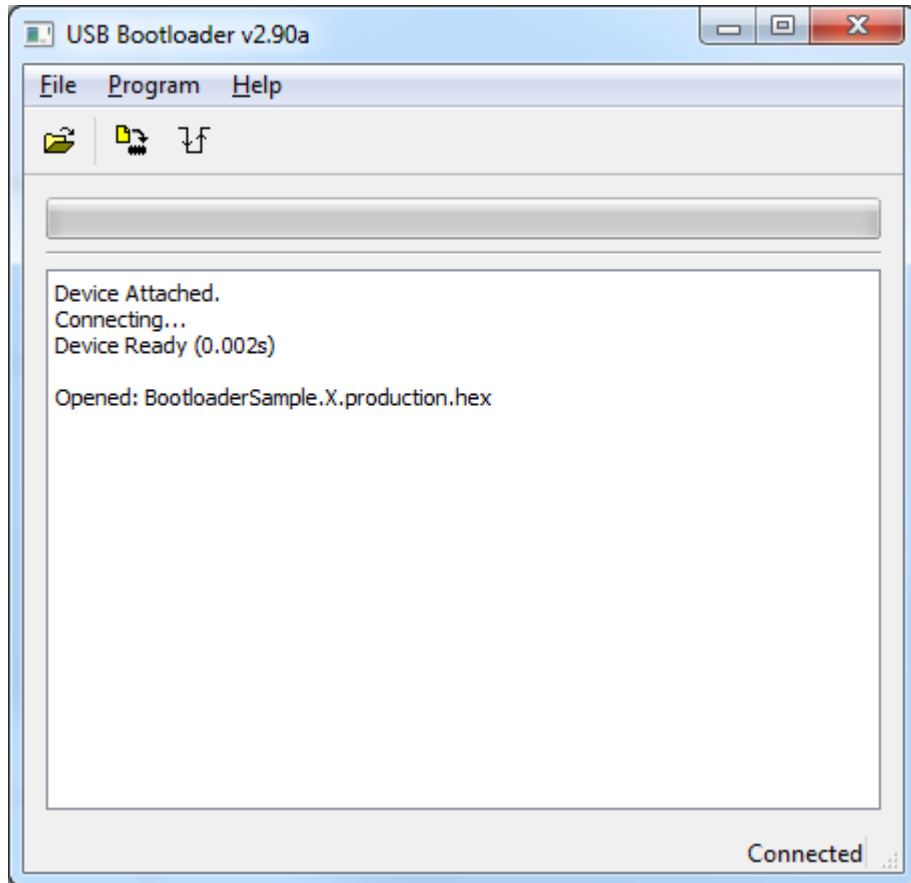
5. Choose File, Import Firmware Image. Browse to the folder you extracted the sample code to. You should see:



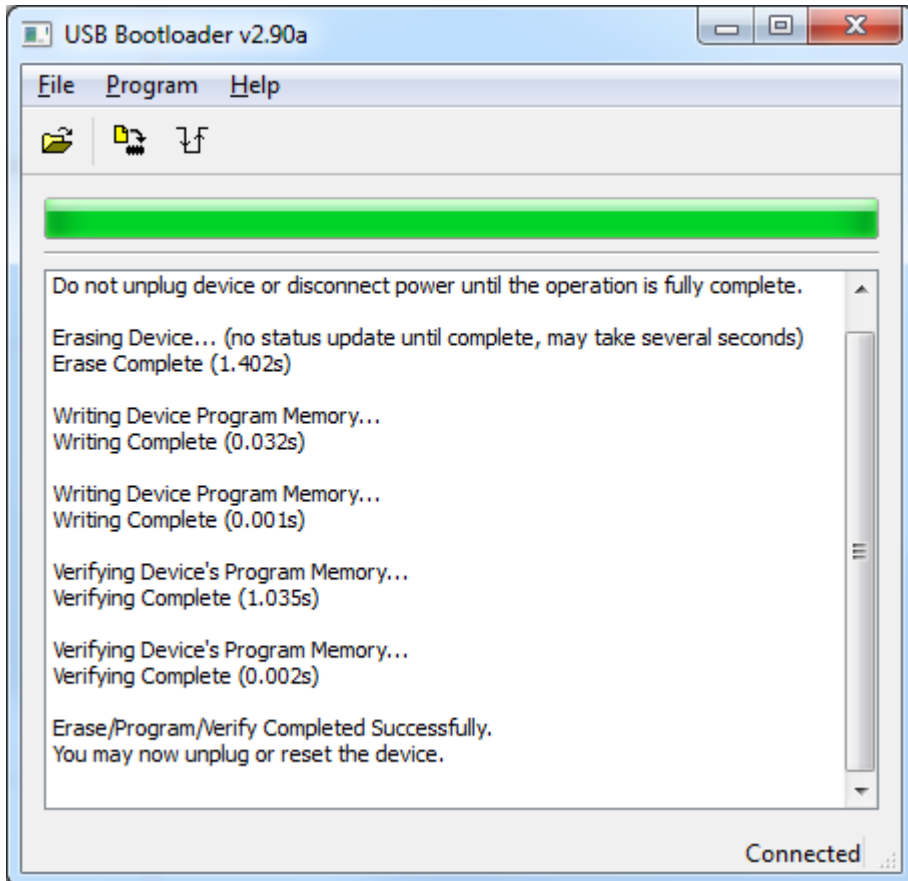
6. Go to "dist", then "default", then "production" and finally select "BootloaderSample.X.product.hex".



The sample is now loaded into the software and ready to flash:



7. Click Program, Erase/Program/Verify Device. If this completes without error, you should see:



This means that the PIC was programmed successfully.

8. Now reset the device by pressing the MCLR button. The sample program should now execute – the LED attached to RD2 should flash, and the LED attached to RD3 will light when the RB2 button is pressed.
9. To re-enter the bootloader and flash a different program, hold RB2 and press MCLR.

You can now make changes to main.c and start adding code to create your own programs.

Using the board with a PICkit2 or PICkit3 programmer

If you wish to use a PICkit2 or PICkit3 programmer instead of the bootloader you can use the programming header provided on the opposite end of the board to the USB port.

Programming the PIC through this header is performed as per the normal method – please be aware that this will overwrite the pre-programmed bootloader. If you wish to use the bootloader again in the future, you must reflash it using your PIC programming software – it is available at:

<http://buyhere22.com/pic/downloads/18F4550%20Bootloader.zip>