



Sparrowboard 1450 PIC18 Development Board

User Guide

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Introduction

Sparrowboard1450 is a compact and simple development board for learning 18 series Microchip PIC microcontrollers. This board has a PIC18F14K50 USB PIC populated with built in bootloader. This single piece of hardware is all you need to get your first program up running. No programmer or other hardware tool is required.

Features

- Plugs directly to PC/Laptop USB port.
- PIC18F14K50 USB microcontroller with bootloader.
- Four on board LED's.
- Reset switch.
- Input switch (used as bootloader select as well).
- 8 IO pins avail-able for user defined functionality.
- Space for ICSP header.
- Very compact and easy to use.

Microcontroller Specifications

- Flash Program Memory-16KB.
- CPU Speed (MIPS) – 12.
- RAM – 768 Bytes.
- Data EEPROM-256 Bytes.
- Communication Peripherals-1-A/E/USART, 1-MSSP(SPI/I2C).
- Capture/Compare/PWM-1 ECCP.
- Timers -1×8-bit, 3×16-bit.
- ADC-9 ch, 10-bit.
- Comparators-2.
- USB-1, USB 2.0 compatible, full speed.

How to use the Module

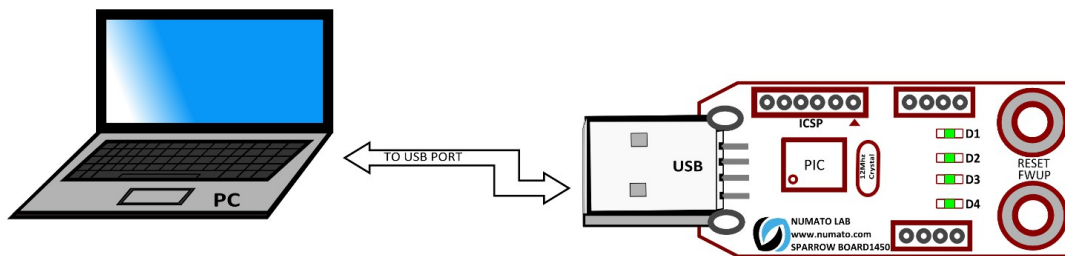
The following section describes how to use this module.

Components/Tools required

Along with the module, you may need the items in the list below for easy and fast installation.

1. PC/LAPTOP With USB Support.

Connection Diagram



Above image shows basic connection diagram that can be used in most of the situations. Use a USB A to Mini B cable for connection to PC. Sparrowboard1450 can be used as a standalone module or can be attached to additional circuitry to extend it's functionality. Four on board LEDs and switch can be used to test simple programs like running lights, Binary Counter etc...The following sections identify individual connections in detail.

USB Interface

The on board full speed USB controller helps a PC/Linux computer to communicate and control this module seamlessly. Use a USB A to Type A Male cable to connect with a PC. By default, the logic section of the module is powered from USB so make sure not to overcrowd unpowered USB hubs (the picture on the right shows USB A Male connector).



Led and Push Button

LEDS are connected to Microcontroller GPIOs in the following order.(the picture on the right shows LED's).



LED	MICROCONTROLLER PIN
D1	RC7
D2	RC6
D3	RC5
D4	RC4

The **FWUP** switch is connected to RB4 GPIO. This switch can be used as a general purpose input in your program. This same switch will be used to put the board in to bootloader mode. Rest of the GPIOs are available on an unshrouded header for other purposes. Also there is a **RESET** switch available on the Module for resetting the module.

GPIOs

The module has 8 GPIO pins that can be used for various custom applications. Some of these pins can be used as Analog to Digital Converter inputs as well. All IO pins support 5V TTL signals and the ADC input range is 0 to +5V. The ADC can acquire analog signal at the resolution of 10 bits per sample. In output mode, each GPIO can source up to 25mA. So no additional circuitry is needed to drive regular LEDs. A 470 Ohms series resistor is recommended for current limiting when connecting LED to a GPIO.

In contrast to GPIO Analog inputs can read voltages at any level between 0 to 5V volts. It is recommended to use a series resistor to protect the input from stray voltages and spikes. The internal Analog to Digital converter supports 10 bits resolution which is adequate for most applications. The table below summarizes the GPIO input positions on the terminals.

HEADER P2

Header pin no	Pin name
1	RC3
2	RC2
3	RC1
4	RC0

HEADER P3

Header pin no	Pin name
1	RB7
2	RB6
3	RB5
4	RB4

How to upload firmware

Most of Numato Lab's USB based products are shipped with pre-programmed bootloader to help with field firmware updates. Please follow the steps below to update the firmware on your product.

1. Identify if your device supports field firmware upgrade

Only USB based devices support field firmware update at this time. If the device does not have a USB connector, chances are that the device does not support field firmware update. Not all USB based devices guaranteed to have field firmware update support either. If the device support field firmware update, there should be a two pin header or push button switch on board with name similar to “FWUP” or “FWUPDATE”. Thoroughly inspect the board and check if such a header is present. If there is no such jumper is present, chances are that the device does not support field firmware update. See example of firmware update switch on the right side.



2. Install prerequisites

The firmware upgrade application currently supported on Windows only. It is important to make sure that all prerequisites are installed before running the application. Following needs to be installed before continuing with firmware upgrade.

- MS VC++ 2008 redistributable package
- MS .Net Framework 2.0

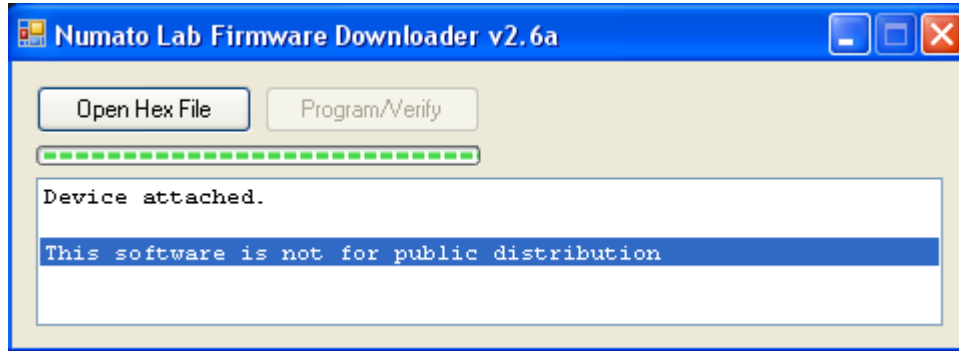
Skip this step if these packages are already installed on your machine. Installers for these two packages are available under “prerequisites” folder in the zip package that is provided with this document. Run the appropriate installers and follow on screen instructions to complete installation.

3. Connecting your hardware to the PC

To activate the bootloader present on the device, press the firmware update push button switch. Once it is short circuited, connect the device to the PC using an appropriate USB cable. Please note that when bootloader is activated, normal features and functions will not be accessible.

4. Downloading the firmware

Run downloader.exe found under bin folder. If everything is setup correct, you should be presented with the following screen.



If you are unable to run the application, please make sure that all prerequisites are installed. If the “Open Hex File” button is grayed out, it means that the bootloader on the device is not activated. Please make sure that the device support field firmware update and revisit step 4 to properly connect the device to PC.

To download the firmware, click on the “Open Hex File” button, browse and select the hex file for the product. When the hex file is selected, the “Program/Verify” button should activate. Click the “Program/Verify” button to complete firmware download.

Technical Specifications

Parameter *	Value	Unit
Basic Specifications		
Number of GPIOs	8	
Number of analog inputs	6	
Digital circuit power supply voltage (USB)	5	V
Maximum current drawn by digital circuitry	95	mA
IO Specifications		
Maximum IO source current	25	mA
Maximum IO sink current	25	mA
GPIO input low voltage	0.8	V
GPIO input high voltage	2	V
GPIO output low voltage	0	V
GPIO output high voltage	5	V
ADC Specifications		
Resolution	10	bits
Full scale range	0 – VDD	V
Reference voltage	VDD	V
Recommended Impedance of Analog Voltage Source	2.5	K Ω

* All parameters considered nominal. Numato Systems Pvt Ltd reserve the right to modify products without notice.

FAQ

Q. What is the connector marked as ICSP on this module?

A. This connector is used to program the on-board microcontroller. This connector is primarily intended for factory use.

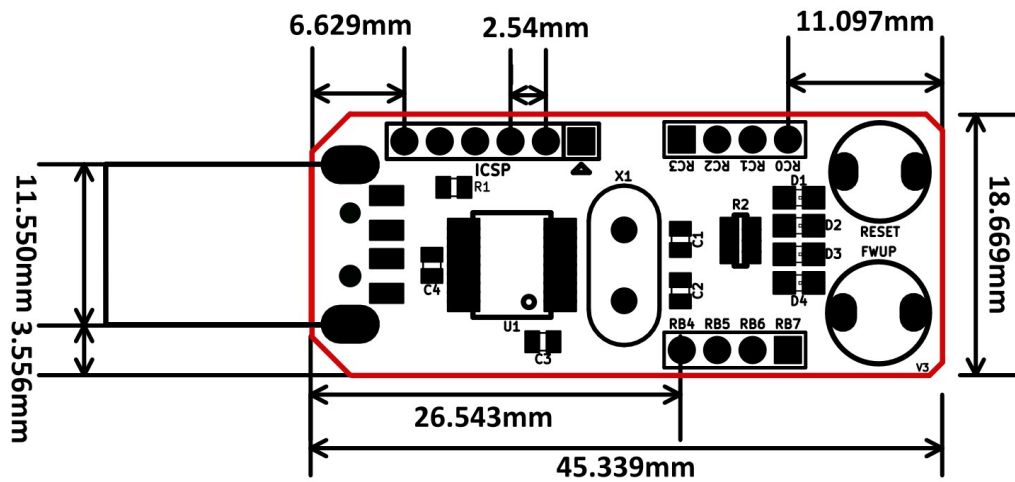
Q. I need a customized version of this product, can Numato do the customization for me?

A. Yes, we can definitely do customization but there may be minimum order requirements depending on the level of customization required. Please write to sales@numato.com for a quote.

Q. Where can I buy this product?

A. All Numato products can be ordered directly from our web store <http://www.numato.com>. We accept major credit cards and Paypal and ship to almost all countries with a few exceptions. We do have distributors in many countries where you can place your order. Please find the current list of distributors at <http://numato.com/distrib>.

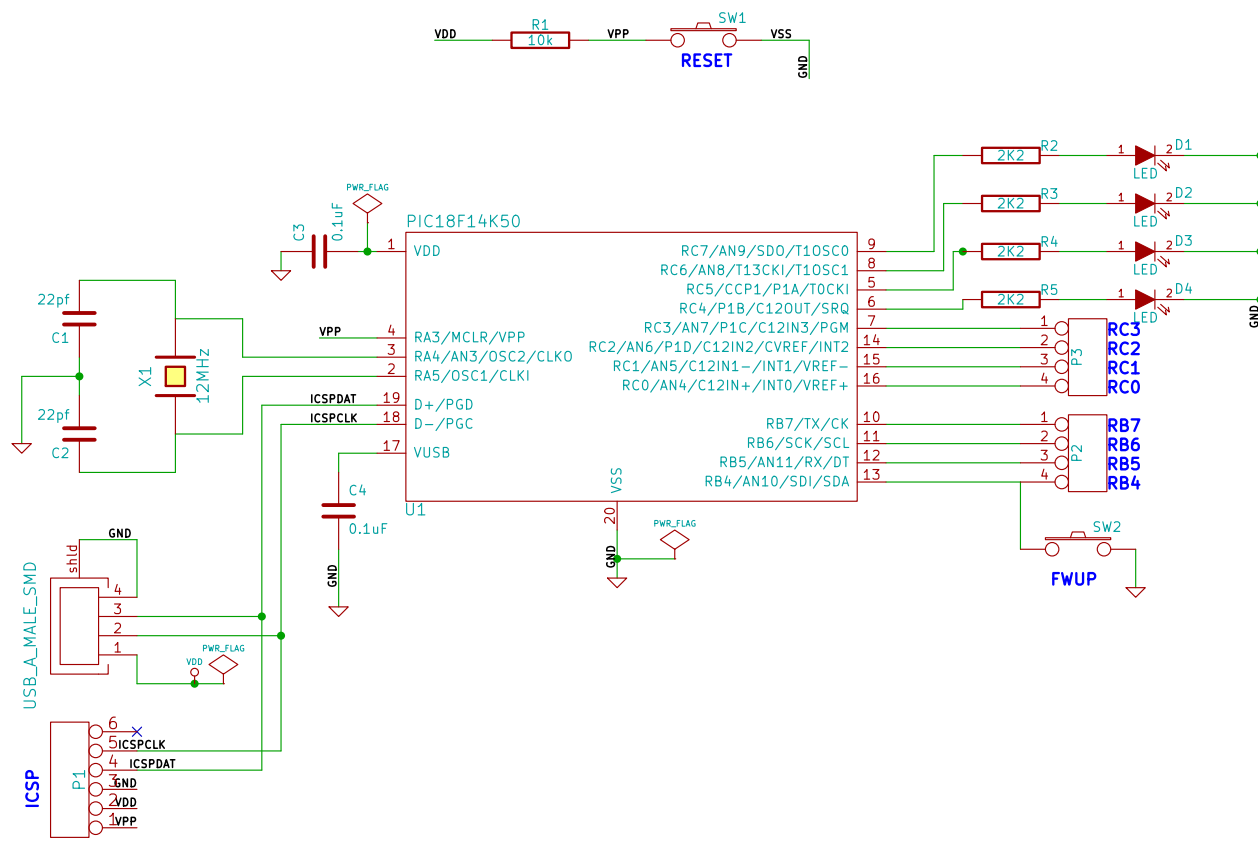
Physical Dimensions



L x W x H : 45.339mm x 18.669mm x 12mm

Schematics

See next page.



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File: Sparrowboard1450PIC18DevelopmentBoard.sch			
Sheet: /			
Title: Sparrowboard1450PIC18DevelopmentBoard			
Size: A4	Date: 10 jun 2015	Rev:	
KiCad E.D.A.		Id: 1/1	