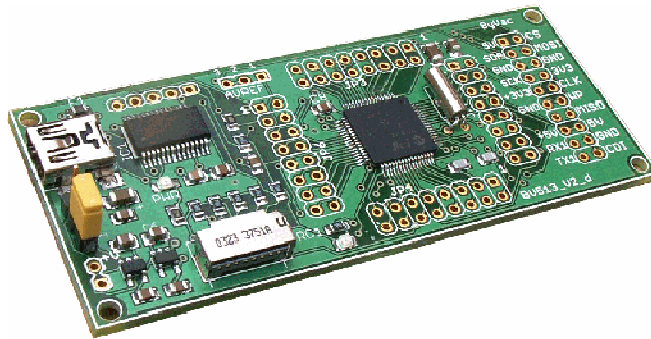

Microcontroller

BV513_V2



BV513_v2

32bit Microcontroller

Product specification

April 2012 V0.a

Microcontroller

BV513_V2

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Rev	Change
April 2012	Preliminary

1. Introduction

The BV513 is a 32bit microcontroller designed to provide a low cost small control solution.

This text describes the hardware only. The BV513_v2 comes complete with a comprehensive BASIC that makes using the device very easy, this is described elsewhere. It can also be programmed in C without the need of a programmer as there is a built in boot loader that operated through the USB interface.

For getting started and examples see the online resource:

<http://doc.byvac.com>

2. Features

- 32bit, PIC32
- BASIC Firmware
- Micro SD Card holder
- USB serial interface
- Nearly all of the processor pins available
- Standard 0.1" layout for plugging into a mother board.
- Supports second SD Card
- 5V regulator on board
- 3.3V regulator on board
- Can be powered from non-regulated source.

3. Versions

This is the second generation of the BV513. The differences from the first are:

- Mini USB
- Holes for mounting
- End connector moved slightly to line up with the 0.1" layout.
- Uses Version 2 Boot loader

The main connector pin-outs remain the same and so V2 is plug compatible with V1.

4. PIC32

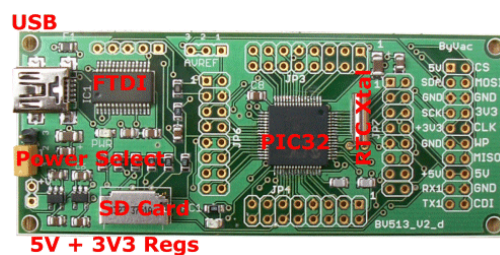
This is a PIC32MX340 with 512k Flash. The specification for this processor is as follows:

- Speed MHz 80
- Program Memory Size (KB) 512
- RAM (KB) 32
- DMA Channels 4
- SPITM 2
- I2CTM Compatible 2
- A/D channels 16
- Max A/D Sample Rate 1000

- Input Capture 5
- Output Compare/Std. PWM 5
- 16-bit Digital Timers 5
- Parallel Port PMP
- Comparators 2
- Internal Oscillator 8 MHz x 10 via PLL

5. Physical Specification

The BV513_v2 is designed as a small footprint microcontroller board that can be built into other designs. Although it can be used as a development board this is not the intention and so there is no bread boarding area or superfluous LED and other devices.



The processor is configured to use the internal oscillator and normally runs at 80MHz. The in built RTC is not used in favour of the external battery backed one. This does not use any of the available I2C channels.

5.1. USB Interface

This is based around the FTDI chip (<http://www.ftdichip.com/>) virtual COM port driver and has up to date drivers for nearly all operation systems including Linux, Microsoft and Apple.

When connected it presents itself as a COM port and communication with the BV513_V2 is via UART 2. Programming and main communication is done via this interface. The firmware as shipped contains BASIC and so it will work straight away. There is also a boot loader (application loader) so that C programs can also be developed without the need of an external programmer.

5.2. Power Supply

The power can be supplied either via the USB or an external source and is selected via a jumper. The power is regulated by an on board 3v3 regulator capable of supplying up to 150mA. The absolute maximum input voltage is 10V.

USB Power 1—2

External Power 2—3

The external power is applied to the two pads that are next to the power selector. Positive is marked on the PCB, the ground pad is square.

The BV513_v2 has two on board regulators and so can provide 5V and 3.3V to external

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equipment. The regulators have a maximum current capability of 150mA.

5.3. Real Time Clock

The board has a 32Khz crystal that provides the oscillator for the RTC and also for the slow timer. There is no battery back up facility on the PIC and so the time will be lost at switch off.

For a battery backed RTC see the BV4236.

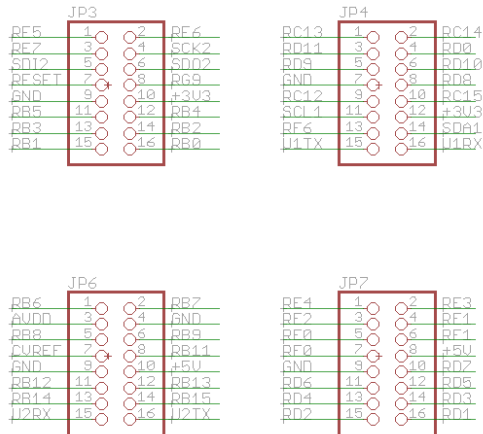
5.4. SD Card

The board has a micro SD Card holder and the BASIC firmware can utilise this although not all micro SD Cards support the SPI interface that BASIC uses.

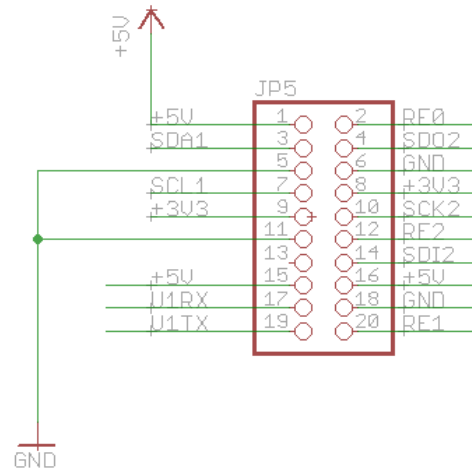
5.5. General I/O

Nearly all of the I/O pins from the PIC32 are brought out to the I/O interface which consists of 5 connector areas.

The pads are not populated with connectors as there are so many options of different types of connector (male, female, turned pins) and also the connectors could be placed on top or the underside of the board.



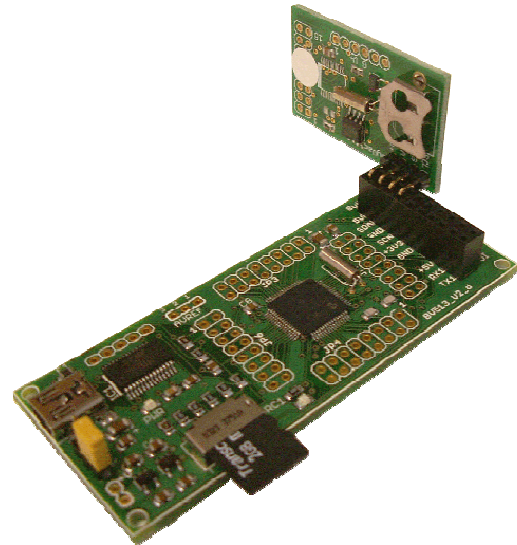
The 4 main connector pin designations are shown here. The JPN names are marked on the PCB. These four are on each side of the microcontroller. Some of these may be used for other purposes see later.



This is the connector at the end of the board, again some of the pins are repeated in the main connector cluster. The purpose of this set of pads is to make interfacing with UART1 and I2C more convenient.

5.6. I2C

This is provided by Pins 1,3,5 and 7 and is plug compatible with other BV devices, the BV4236 RTC for example.



BV513_V2 with RTC

*** NOTE: The BV513_V2 does not have any pull up resistors and so these need to be provided. In the above picture that are soldered to the underside of the connector.

5.6.1. Serial

The serial interface is formed with pins 11,13,15,17 and 19. Again this is compatible with other BV devices.

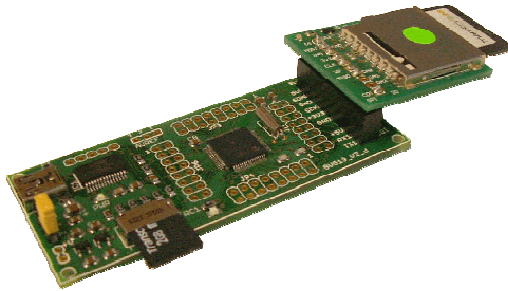
5.6.2. Second SD Card

The whole of the even numbered side of the connector is used as this provided the SPI and

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CS lines required. The BV400 / BV410 SD Card holder is plug compatible.



Pins 16 and 18 are not connected but the rest are. When used in this configuration BASIC will recognise this as a second SD Card.

6. I/O Port Usage

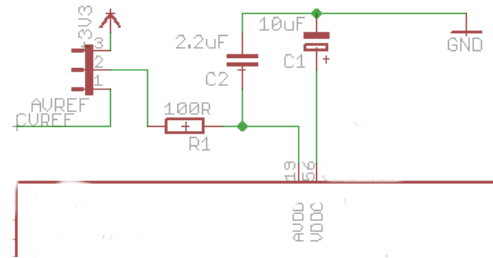
Some of the i/o is used for the board itself but these may also be brought out to one of the connectors.

UART2	
I/O	Description
UTRX(RF4)	This goes to the TX pin of the FTDI Chip, pin 1
UTTX(RF5)	This goes to the RX pin of the FTDI Chip, pin 5
RB8	Connected to the RTS pin of the FTDI chip pin 3
RB14	Connected to the CTS pin FTDI chip pin 11
***	NOTE the DTR pin of the FTDI chip, pin 2 goes to the reset pin on the microcontroller but via a capacitor.

Micro SD Card	
I/O	Description
RFO	Chip Select CS
RC12	G4 on the micro SD socket. This is normally pulled high by a 10k resistor, when a card is inserted this is taken to ground.
SDI2(RG7)	to MISO on SD Card socket
SDO2(RG8)	to MOSI on SD Card socket
SCK2(RG6)	to Clock on SD Card socket

On Board LED	
I/O	Description
RC15	When taken low the LED illuminates.

7. AVREF

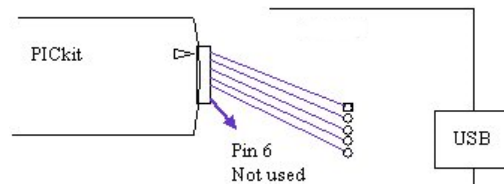


There is a 3 pad connector to the top of the board marked AVREF. A closer inspection will reveal that pads 2 and 3 are shorted together by a track on the top of the board.

This by default connects the AVREF used for A to D conversion to the 3.3V line via a 100R resistor that is smoothed by a 2.2uF capacitor. The PIC also can provide a reference via CVREF (RB10). To use this or another reference, cut the track and short out the pins appropriately. See the PIC data sheet for more information.

8. Programming Socket

The programming socket is provided for installing the firmware at the factory. There is no need for a programmer when using this device as there is a built in application loader that can load any binary files required. This information is only provided for completeness of for those who which to program from scratch.



There is a row of 5 pads near the FTDI Chip, the diagram is not quite accurate. The square pad is pin 1. A PICKit can be connected directly to this connector in a 1:1 arrangement, pin 6 is not used. The square pad is pin 1.

A back to back pin head can be used and simply held in place.

WARNING: Using a programmer will overwrite the boot loader and thus BASIC will not be able to be loaded again. The boot loader is not available and can only be obtained when purchasing the BV513. Make sure before using this that you will never need to use BASIC again – You can use the boot loader for programming in C so you should never need to use this.

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9. Firmware

The BV513_V2 uses version 2 boot loader, sometimes referred to as the Application Loader.

Upgrading the firmware can be carried out using BV_COMM2 a detailed description is here:

http://doc.byvac.com/index.php5?title=BASIC_Installation#Version_2_Boot_Loader

It is recommended that this is used in preference to a PIC programmer see warning in that section.

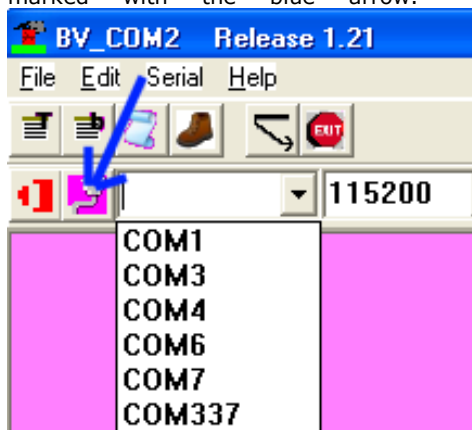
The device comes pre-loaded with BASIC which will simply start as soon as a COM connection is established.

10. Getting Started

This is covered elsewhere and is more likely to be up to date than here as the documentation site is updated on a regular basis but the data sheet are not.

Having said that, this does refer directly to the BV513_V2.

- 1) Start BV_COM, this can be found in the downloads section of www.doc.byvac.com Alternatively use some other terminal software.
- 2) Plug the BV513_v2 to the USB on the PC. The FTDI driver is so popular that you may already have it installed, if not ; install it. See section 5.1.
- 3) When the BV513_v2 is plugged in and the FTDI driver is installed correctly it will create a COM port.
- 4) Update the COM ports list on BV_COM2 using the menu icon marked with the blue arrow.




- 5) You can now use the drop down to select the correct COM port
- 6) Connect using the red connect icon and it will turn green.

Some notes: Make sure that the red icon is green it is easy to forget to connect. Change

This  to this 

At any time the BV513_v2 can be reset from

BV_COM2 by using the reset icon. 

This will assert DTR which is connected via a capacitor to the reset on the microcontroller.

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11. Appendix Dimensions

