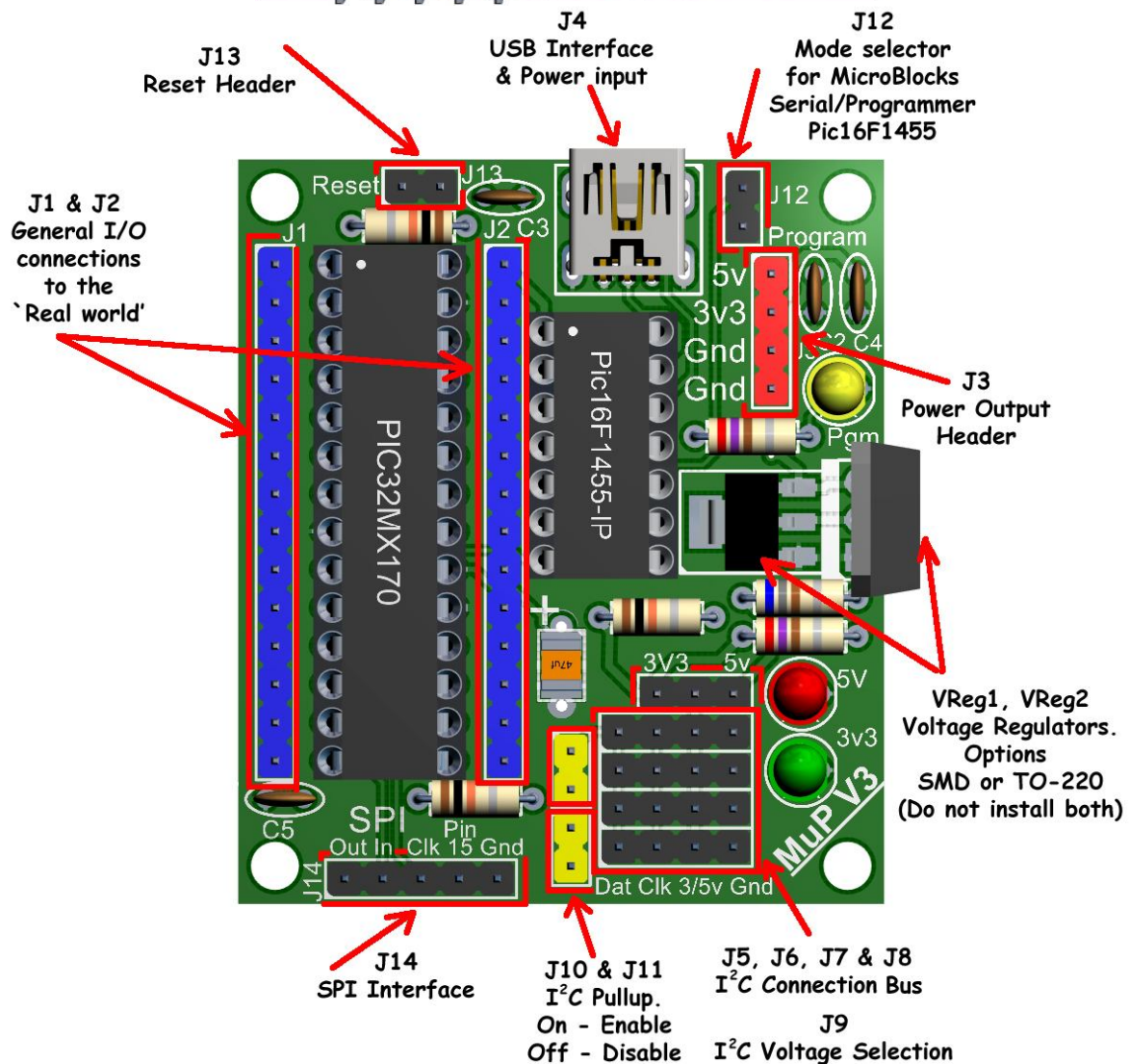
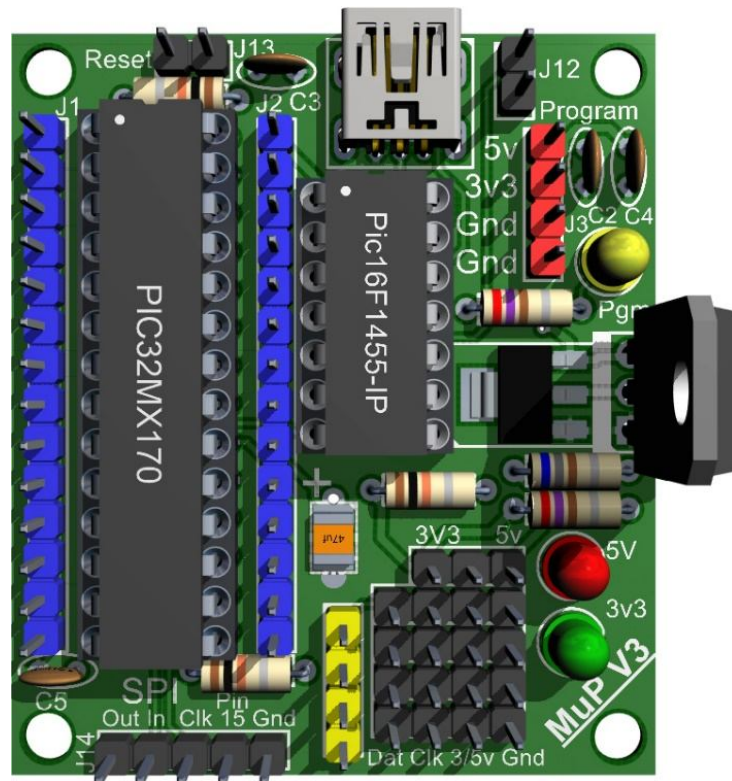


# Mick's uMite PCB (MuP) Ver. 3

By Mick Gulovsen

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Ver. 1.1



# Board Concept.

Full hardware design for the MicroMite (uMite) project can be found here:

<http://geoffg.net/micromite.html>

The Mick uMite PCB (from here on called MuP) was originally released in May-2014 and has proven to be very popular. With the advent of MicroBlocks PIC16F1455 based Serial-TTL and PIC programmer chip I have decided to create MuP Ver 3 and incorporate this chip in the design. This chip, hereafter called the **U2SP** chip, not only provides the USB functionality that the uMite needs to communicate to a connected PC it also has cleverly included a programming function (described later in this manual). This chip is not public domain and can be purchased separately from MicroBlocks or, as I have permission from MicroBlocks to distribute these, from me.

I have kept MuP Ver3 the exact same size as MuP Ver2 and kept the 3 headers J1, J2 & J3 in the same locations, relative to each other, so that plug in boards would still be functional and interchangeable between version 2 and version 3.

This document should be read in conjunction with the manual for MuP version 2 as there are many similarities in its design, although MuP version 3 has been redesigned from scratch.

## Changes and additions from Version 2.

I have made several changes to Version 3 and as a consequence some headers and components have been removed and others have been added. The following are the most obvious differences with Version 3.

1. MuP Ver.3 may now be built entirely using through-hole components. The only SMD components are the VCap (which I have added two THP pads to use a standard Tantalum if you chose to do so) and VReg 1 (which may be **substituted** by a TO-220 version, in the VReg 2 position). **NOTE!! Do NOT install both VRegs as that will cause instability of the power supply.**
2. Removed the option for a USB-TTL cable as the on-board **U2SP** chip does that function for you.
3. Added a 5 pin SPI header interface.
4. Added a Reset header.

5. Added a Pgm header. (see details later in this document)
6. Added a Pgm LED. (see details later in this document)
7. Added support for the **U2SP** chip.
8. Added a mini-USB (THP) connector.

## Connections.

### J1 & J2 (I/O)

These are direct connections to the adjacent pins of the Pic32MX170 chip with the one exception being that **J2** pin 9 (would equate to PIC pin 20) as Pic pin 20 is the +Ve for the cap at C1 and should have no other connections to it, so this pin is connected to GND instead.

These are the main connection points for interfacing to the `outside world'. Solder Male or Female headers to these position as suits your application.

### J3 (Power)

This is primarily a power **outlet** port but *`could'* be used as an input power port ***IF*** the USB is not connected to a 5v power source. NOTE! If you connect to external devices that require high current draw they will need their own 5V power source as the USB input is limited to 500mA (MuP Ver3 will draw around 40mA).

**NOTE!** Do NOT connect 3v3 ***from*** an external source if any of the Voltage Regs. (VReg1 or VReg2) are fitted as this will cause power supply instability as the two power sources fight against each other.

### J4 (USB)

This is the USB connection to a PC and also doubles as a power **INPUT** source for MuP Ver. 3. Simply connect your USB cable from your PC and use a communications program such as TeraTerm to communicate to the MicroMite processor (default is 38440 baud 8N1). This port is also used to flash the PIC170 with MMBasic (or whatever other HEX code you want to run) using PIC32PROG.EXE as detailed below:

Firstly, set the **U2SP** chip into PROGRAM mode by momentarily shorting the Pgm (J12) header pins. You should see the Yellow Pgm LED illuminate (a second short of J12 will set it back in to SERIAL mode, turning off the LED).

Connect to your PC and run PIC32PROG.EXE from a `Command Prompt' (CMD in windows) type the following command string. Replace xx (in red) with the Comm port your **U2SP** chip comes up as in windows.

```
pic32prog -d ascii:comxx MMFirmware.hex
```

Note!! That due to the communication buffer in windows, you might get an immediate error the first time you run the above command, simply resend the command and all should be good. PIC32PROG.EXE doesn't flush the buffer before it tries sending the .HEX file to the PIC170. After 30 seconds to 2 minutes (depending on the speed of your computer and USB ports) you should see a report of a successful flash.

Short J12 momentarily to exit program mode and reset or repower MuP V3 and you should be happily running MMBasic or whatever code you flashed into your '170.

## **J5, J6, J7, J8 & J9**

These are designed for use with I<sup>2</sup>C devices.

The left hand column (4 vertical pins) all connect to the **Data** for I<sup>2</sup>C communication.

The second column (4 vertical pins) all connect to the **Clock** for I<sup>2</sup>C communication.

The third column (4 vertical pins) all connect to **3v3** or **5V**, depending on **J9** setting.

The right hand column (4 vertical pins) all connect **Gnd**.

**J9** is for a jumper to select the operating voltage, (third pin), of the I<sup>2</sup>C connectors.

ie. **3v3** (link pin 1&2) or **5V** (link pin 2&3).

This allows up to four I<sup>2</sup>C devices to be easily connected to the MuP via a 4 pin header to pick up the Dat/Clk/Power/Gnd signals.

## **J10, J11 (I<sup>2</sup>C Pullups)**

I have provided for the provision of pull-up resistors for the I<sup>2</sup>C headers on the MuP, these would not normally be connected if you are using Pin(17) or Pin(18) for other purposes as they may affect the performance of these pins.

If you wish to use I<sup>2</sup>C the Jumpers (J10 & J11) need to be installed, If not using I<sup>2</sup>C REMOVE the jumpers.

I suggests the following values for R4 & R5 if you do wish to use I<sup>2</sup>C.

**10k $\Omega$  for 100KHz operation**

**4k7 $\Omega$  for 200KHz operation**

**2k $\Omega$  for 400 kHz operation**

## **J12 (Program select)**

J12 is used to set the **U2SP** chip into PROGRAM mode by momentarily shorting the Pgm (J12) header pins. You should see the Yellow Pgm LED illuminate (a second short of J12 will set it back in to SERIAL mode, turning off the Pgm LED). If you have MuP connected to your PC running a terminal program, such as TeraTerm, you should see the status reported on the screen with each change of mode.

## **J13 (Reset)**

J13 is the Reset header. Shorting these pins momentarily will reset the PIC32MX170 processor.

## **J14 (SPI Header)**

J14 is a convenient header for SPI use, it has the following connections to communicate with SPI peripherals.

SPI out

SPI in

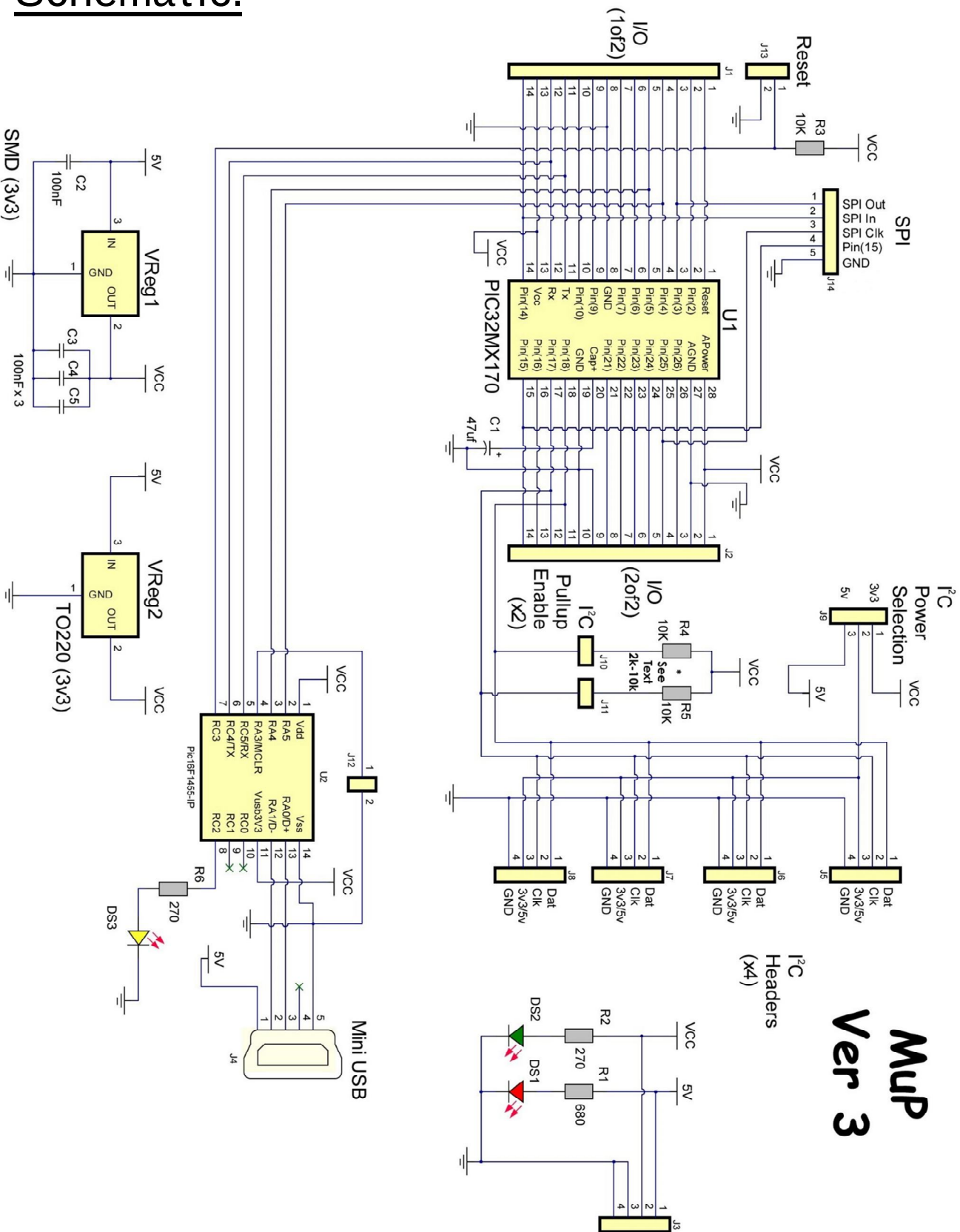
SPI clock

Pin(15) to be used as a Chip Select if desired

GND

# MuP Ver 3

## Schematic.



# Bill of Materials

| Reference | Type            | Description                                     |
|-----------|-----------------|-------------------------------------------------|
| C1        | 47uf            | Tantalum, 6v3 Low ESR 3225 SMD (or THP)         |
| C2        | 100nF           | 0.1" (2.54mm) Ceramic or Monolythic             |
| C3        | 100nF           | 0.1" (2.54mm) Ceramic or Monolythic             |
| C4        | 100nF           | 0.1" (2.54mm) Ceramic or Monolythic             |
| C5        | 100nF           | 0.1" (2.54mm) Ceramic or Monolythic             |
| DS1       | Red             | Standard 3mm Red LED                            |
| DS2       | Green           | Standard 3mm Green LED                          |
| DS3       | Yellow          | Standard 3mm Yellow LED                         |
| J1        | Header 14x1M    | 0.025 Male square pin header 14x1               |
| J2        | Header 14x1M    | 0.025 Male square pin header 14x1               |
| J3        | Header 4x1M     | 0.025 Male square pin header 4x1                |
| J4        | Mini USB        | Mini-USB THP R/A PCB mount                      |
| J5        | Header 4x1M     | 0.025 Male square pin header 4x1                |
| J6        | Header 4x1M     | 0.025 Male square pin header 4x1                |
| J7        | Header 4x1M     | 0.025 Male square pin header 4x1                |
| J8        | Header 4x1M     | 0.025 Male square pin header 4x1                |
| J9        | Header 3x1M     | 0.025 Male square pin header 3x1                |
| J10       | Header 2x1M     | 0.025 Male square pin header 2x1                |
| J11       | Header 2x1M     | 0.025 Male square pin header 2x1                |
| J12       | Header 2x1M     | 0.025 Male square pin header 2x1                |
| J13       | Header 2x1M     | 0.025 Male square pin header 2x1                |
| J14       | Header 5x1M     | 0.025 Male square pin header 5x1                |
| R1        | 680R            | 250mW 5 %                                       |
| R2        | 270R            | 250mW 5 %                                       |
| R3        | 10K             | 250mW 5 %                                       |
| R4        | 2K - 10K        | 250mW 5 % * See Text Re. I2C Pull-ups           |
| R5        | 2K - 10K        | 250mW 5 % * See Text Re. I2C Pull-ups           |
| R6        | 270R            | 250mW 5 %                                       |
| U1        | PIC32MX170F256B | Recommend a machine pin socket be used          |
| U2        | PIC16F1455-IP   | Recommend a machine pin socket be used          |
| VReg1     | LM1117-3v3      | SMD (3v3) * User choice VReg1 <u>OR</u> VReg2   |
| VReg2     | LM1117-3v3      | TO220 (3v3) * User choice VReg1 <u>OR</u> VReg2 |



# 28 Pin Micromite Connections

(reprinted, with kind permission by Geoff Graham)

The following diagram shows the possible functions of each I/O pin on the Micromite.

Note that the physical pins on the chip and the pin numbers used in MMBasic are the same. This means that nine pins are not available in MMBasic as they are dedicated to functions such as power and ground. These pins are highlighted in grey in the diagram.

|                                              |    |    |                                               |
|----------------------------------------------|----|----|-----------------------------------------------|
| RESET Wired to +V directly or via 10K resist | 1  | 28 | ANALOG POWER (+2.3 to +3.6V)                  |
| DIGITAL   INT   ANALOG                       | 2  | 27 | ANALOG GROUND                                 |
| SPI OUT   DIGITAL   INT   ANALOG             | 3  | 26 | ANALOG   DIGITAL   PWM 2A                     |
| PWM 1A   DIGITAL   INT   ANALOG              | 4  | 25 | ANALOG   DIGITAL   SPI CLOCK                  |
| PWM 1B   DIGITAL   INT   ANALOG              | 5  | 24 | ANALOG   DIGITAL   PWM 2B                     |
| PWM 1C   DIGITAL   INT   ANALOG              | 6  | 23 | ANALOG   DIGITAL                              |
| COM1: ENABLE   DIGITAL   INT   ANALOG        | 7  | 22 | DIGITAL   5V   COM1: RECEIVE                  |
| GROUND                                       | 8  | 21 | DIGITAL   5V   COM1: TRANSMIT                 |
| COM2: TRANSMIT   INT   DIGITAL               | 9  | 20 | 47µF TANT CAPACITOR (+)                       |
| COM2: RECEIVE   INT   DIGITAL                | 10 | 19 | GROUND                                        |
| CONSOLE Tx (DATA OUT)                        | 11 | 18 | DIGITAL   5V   COUNT   I <sup>2</sup> C DATA  |
| CONSOLE Rx (DATA IN)                         | 12 | 17 | DIGITAL   5V   COUNT   I <sup>2</sup> C CLOCK |
| POWER (+2.3 to +3.6V)                        | 13 | 16 | DIGITAL   5V   COUNT   WAKEUP   IR            |
| SPI IN   5V   DIGITAL                        | 14 | 15 | DIGITAL   5V   COUNT                          |

The notation is as follows (the mnemonic in brackets is the mode used in the SETPIN command):

|                      |                                                                                                                  |
|----------------------|------------------------------------------------------------------------------------------------------------------|
| ANALOG               | These pins can be used to measure voltage (AIN).                                                                 |
| DIGITAL              | Can be used for digital I/O such as digital input (DIN), digital output (DOUT) and open collector output (OOUT). |
| INT                  | Can be used to generate an interrupt (INTH, INTL and INTB).                                                      |
| COUNT                | Can be used to measure frequency (FIN), period (PIN) or counting (CIN).                                          |
| 5V                   | These pins can be connected to 5V circuits. All other I/O pins are strictly 3.3V maximum.                        |
| COM xxx              | These are used for serial communications (see Appendix A)                                                        |
| I <sup>2</sup> C xxx | These are used for I <sup>2</sup> C communications (see Appendix B)                                              |
| SPI xxx              | If SPI is enabled these pins will be used for SPI I/O (see Appendix D)                                           |
| PWM xxx              | PWM or SERVO output (see the PWM and SERVO commands)                                                             |
| IR                   | This can be used to receive signals from an infrared remote control (see the IR command)                         |
| WAKEUP               | This pin can be used to wake the CPU from a sleep (see the CPU SLEEP command).                                   |

## Useful Links:

PIC32PROG.exe may be found here

<https://github.com/sergev/pic32prog>

Further information on the software and hardware implementation of the MicroMite can be found in the forums located here:

[http://www.thebackshed.com/forum/forum\\_topics.asp?FID=16](http://www.thebackshed.com/forum/forum_topics.asp?FID=16)

The **U2SP** chip can be purchased from MicroBlocks (web site below) or alternatively it may be ordered from me.

<http://microblocks.asia/>

Full hardware design for the MicroMite (uMite) project can be found here:

<http://geoffg.net/micromite.html>

The Back Shed Microcontroller Forum

[http://www.thebackshed.com/forum/forum\\_topics.asp?FID=16](http://www.thebackshed.com/forum/forum_topics.asp?FID=16)

[MicroMite.org](http://MicroMite.org) (stock a range of other uMite goodies including my boards)

Dontronics, A supplier of other hobbyist items and microprocessor boards

<http://www.shop-dontronics.com/>

A shameless plug of other Products and offerings I have to offer

[http://www.thebackshed.com/forum/forum\\_posts.asp?TID=6992&KW=\\*\\*\\*](http://www.thebackshed.com/forum/forum_posts.asp?TID=6992&KW=***)

Or

<http://www.dontronics.com/micks-mite/files/>