

*MODULAR PIC
MICROCONTROLLER
BOARD*

The Machine Shop

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Layout

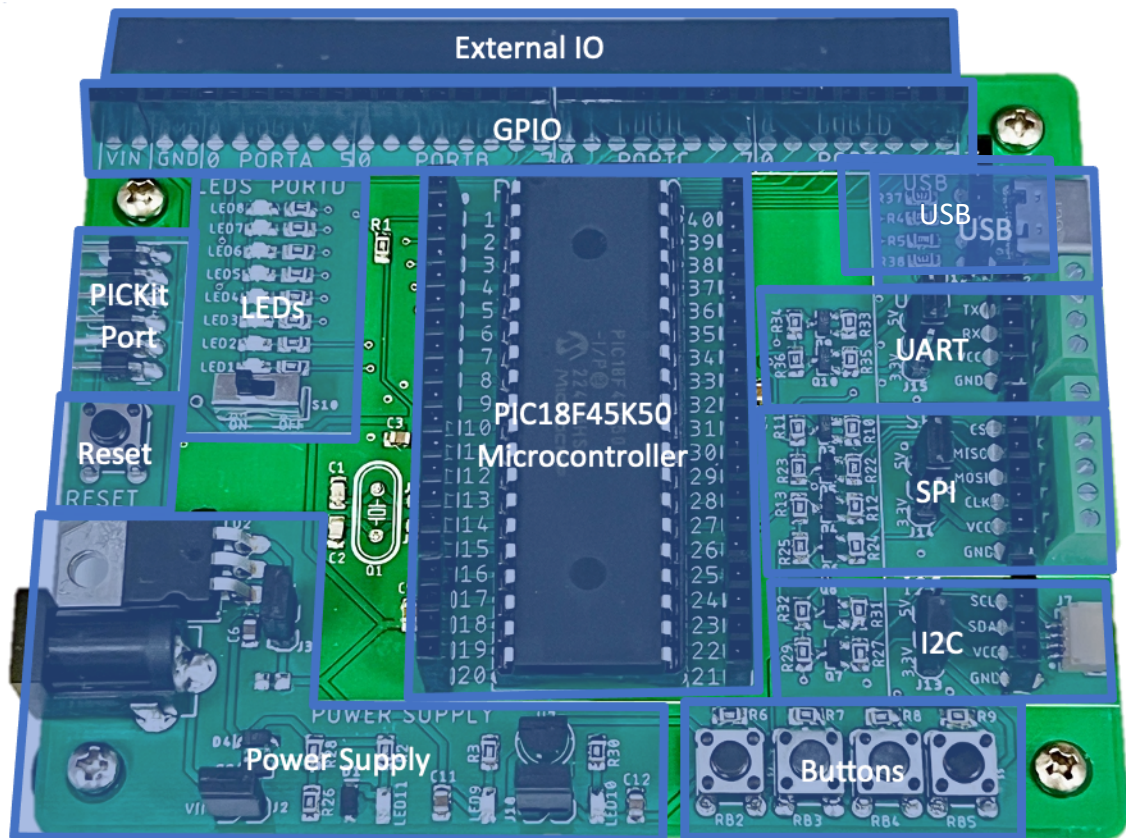
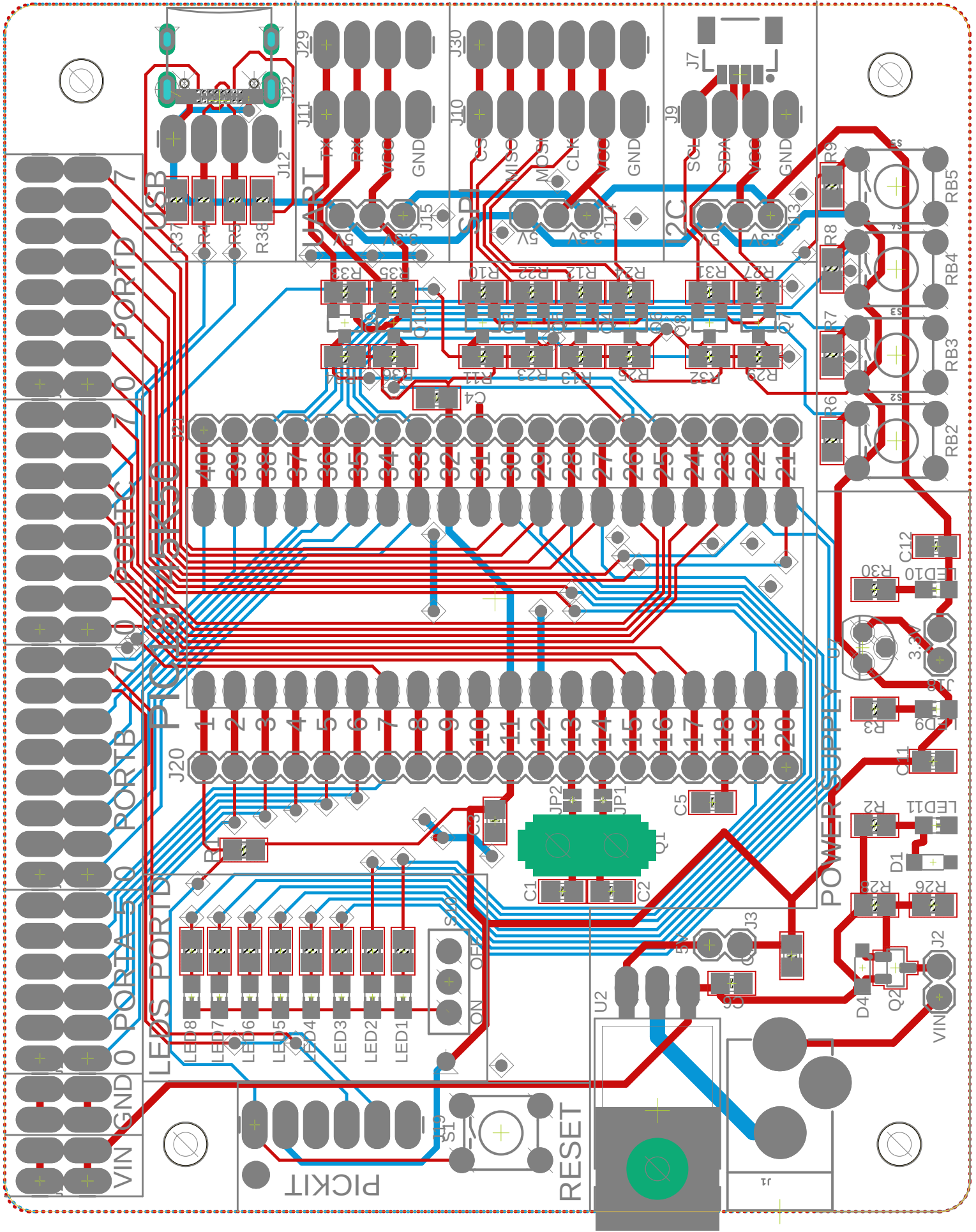
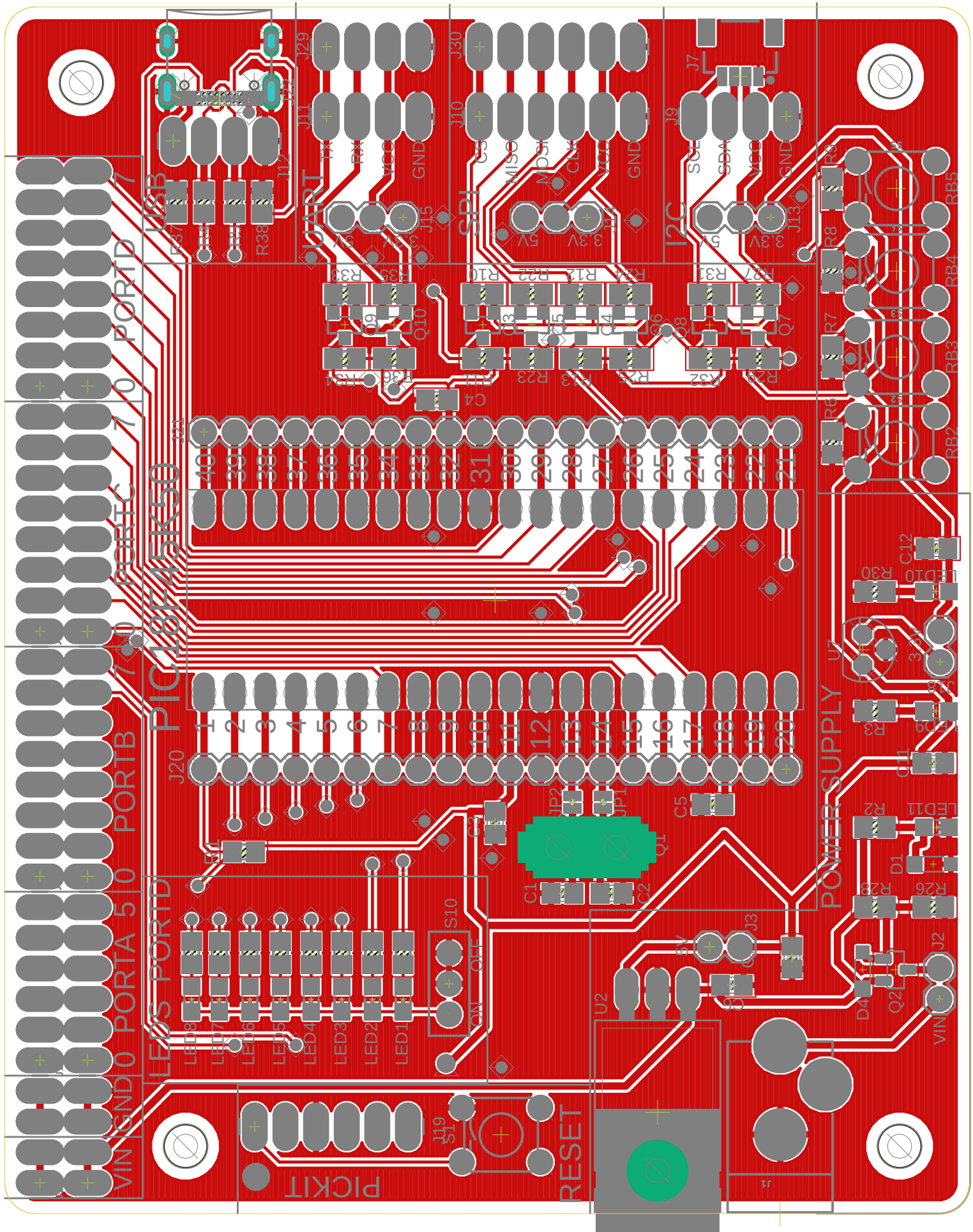


Figure 1 - Board Layout

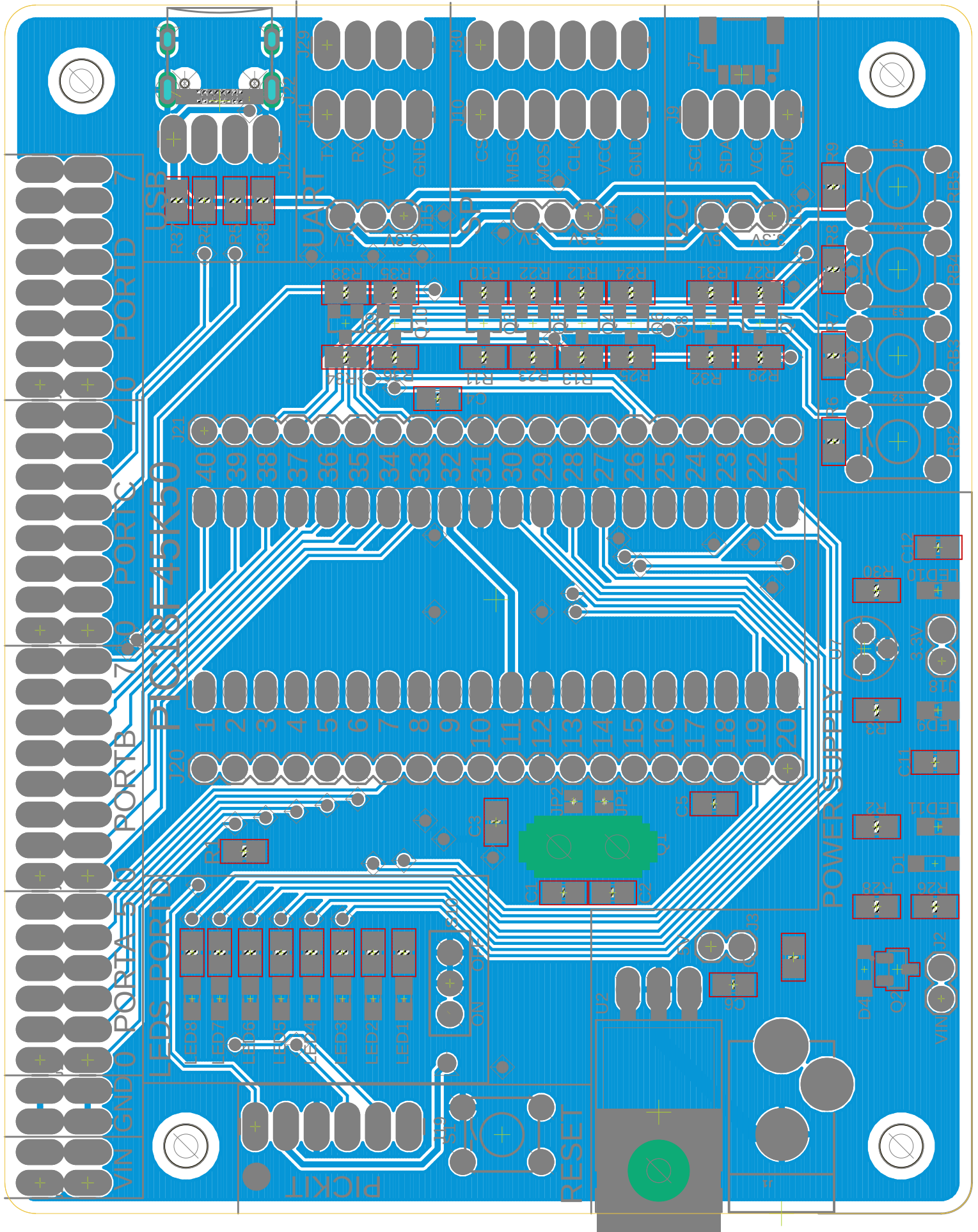
PCB Layout



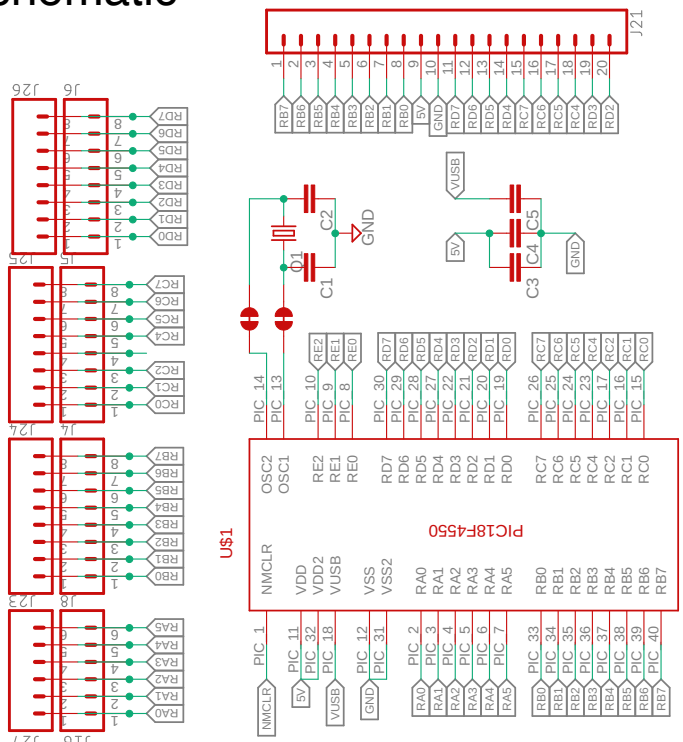
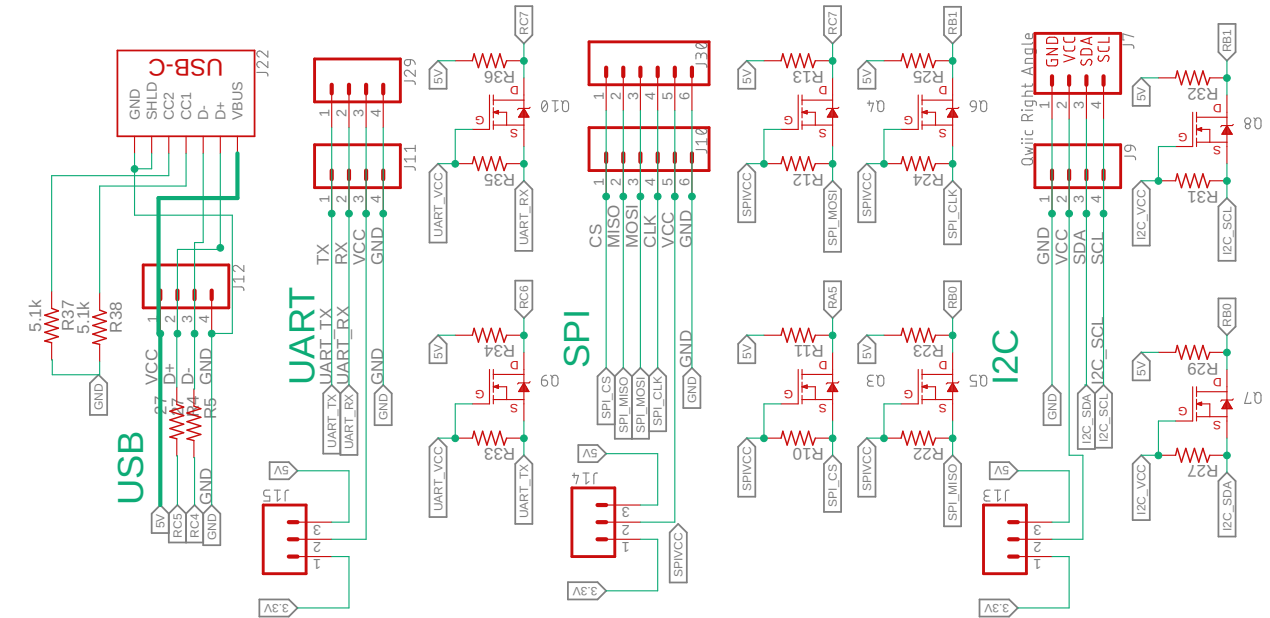
PCB Top Layer



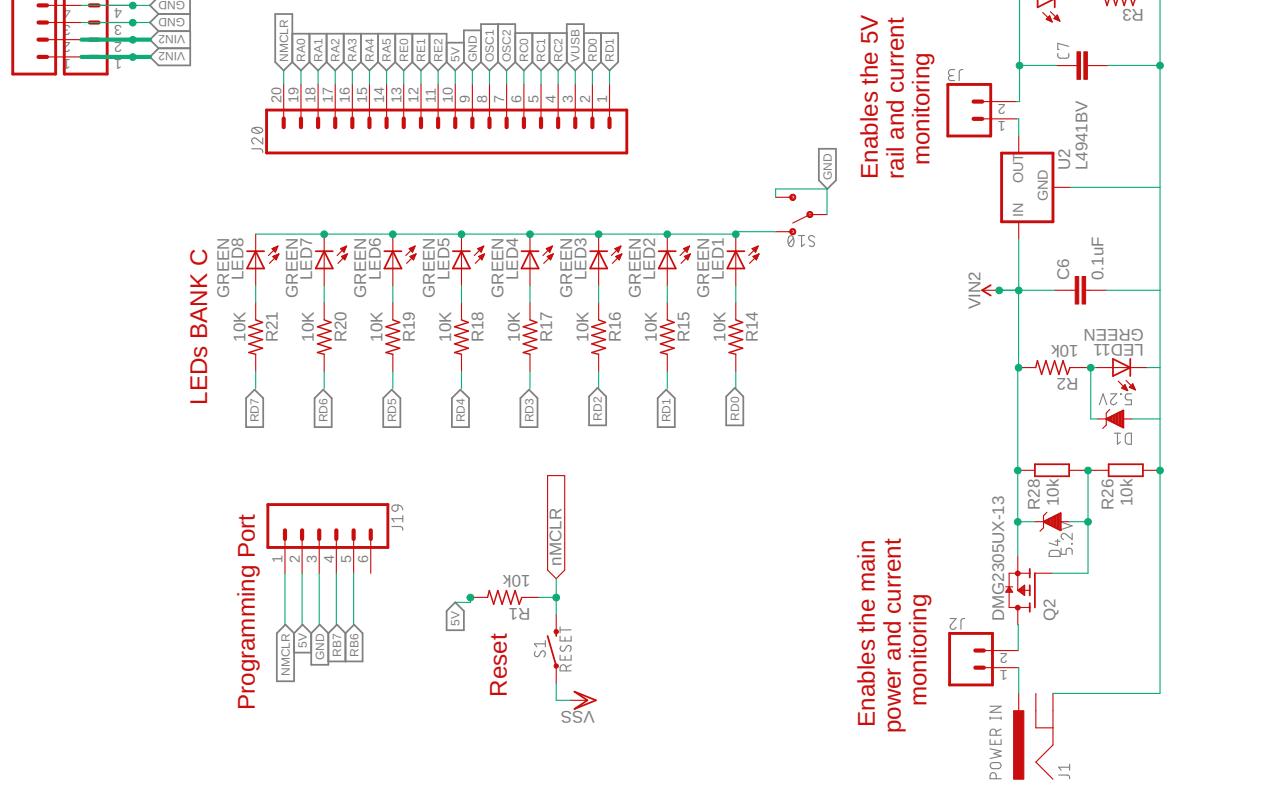
PCB Bottom Layer



Schematic



PIC18F4550



Enables the main power and current monitoring

Enables the 5V rail and current monitoring

Enables the 3.3V rail and current monitoring

Buttons

Programming Port

LEDs BANK C

USB

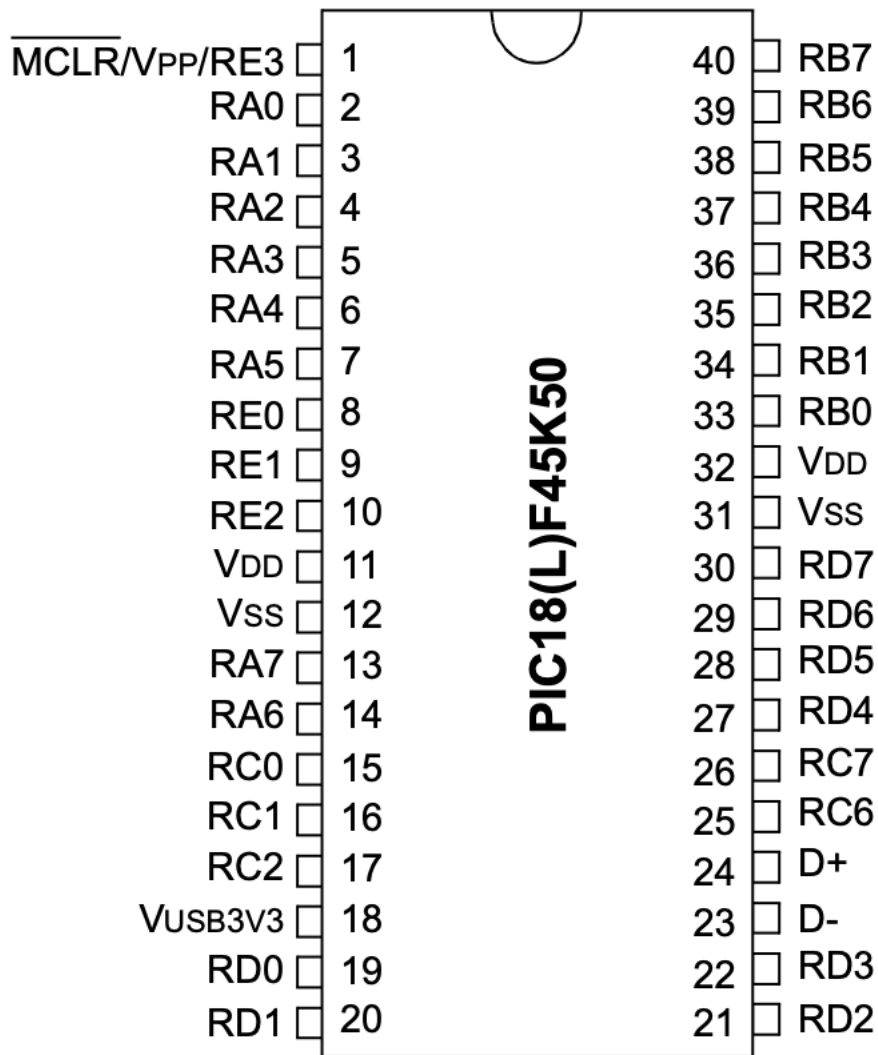
UART

SPI

I2C

US1

PIC Microcontroller Pinout



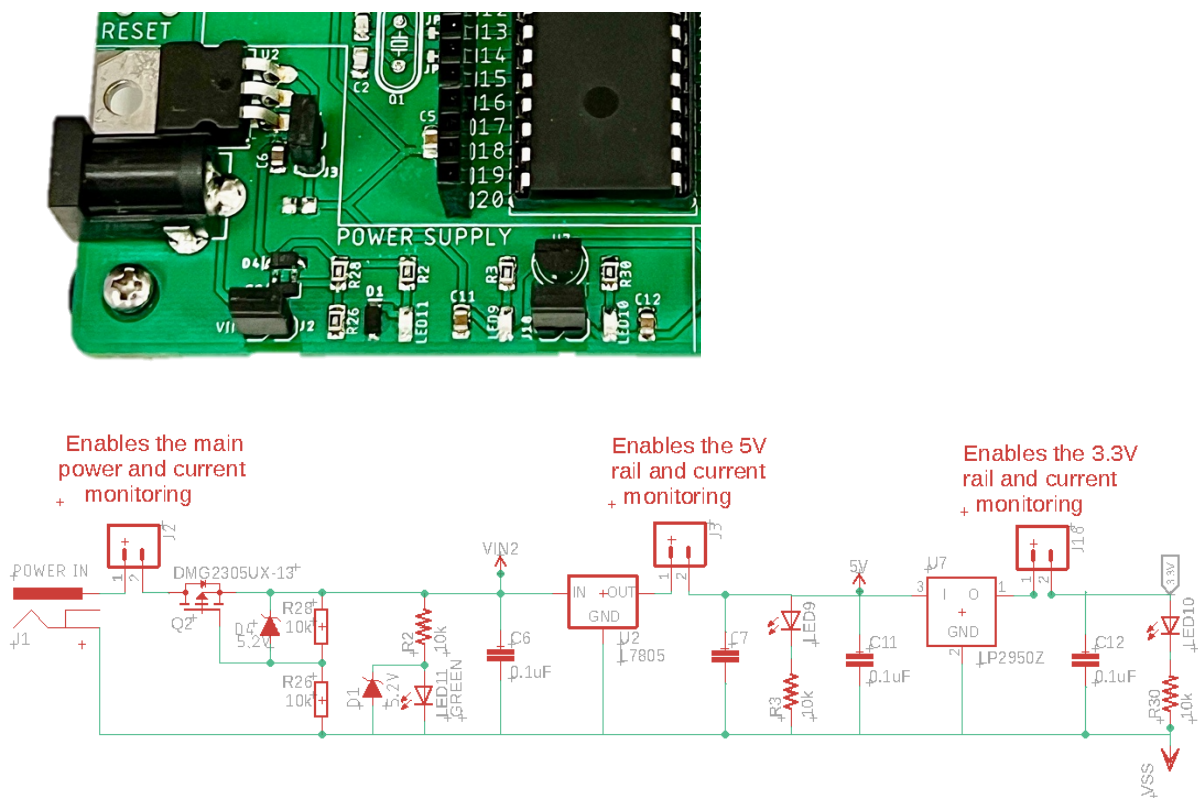
Power supply

The modular PIC board can be powered in a few different ways. Via the on board power supply, the USB-C port, the communications ports (if 5V is supplied), the programming header, and the GPIO headers.

The Built in power supply requires a 2.1mm centre positive DC jack power supply that can provide 7-18V DC power with a minimum of 0.1 Amps, more power may be required for the add-on boards and accessories.

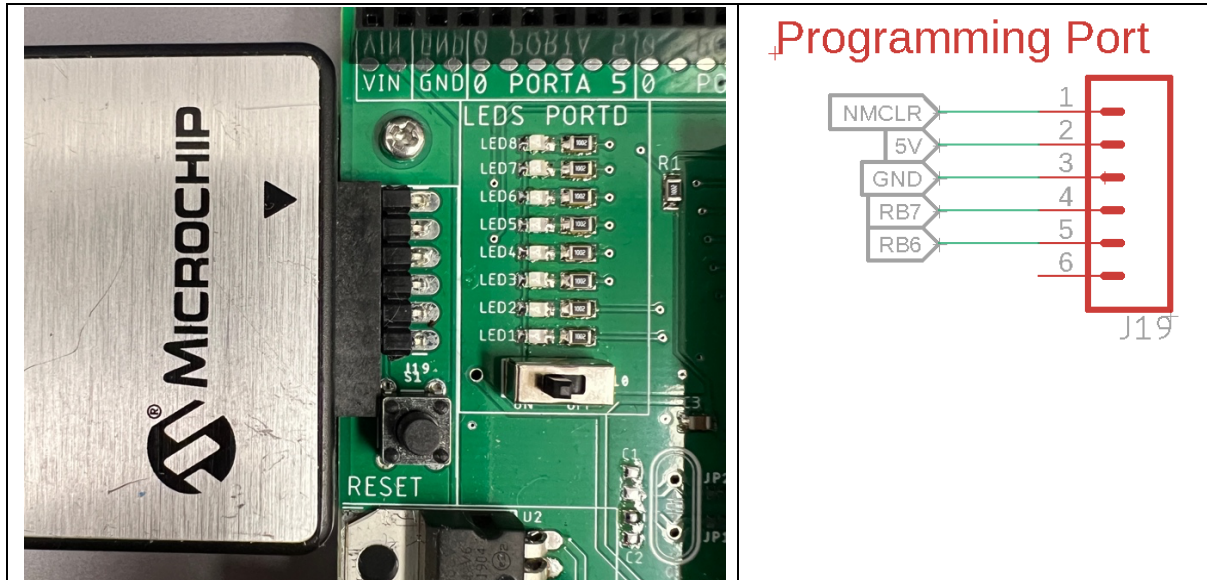
The power supply has reverse polarity protection on the DC jack but this is not available on the other power input points e.g. GPIO. If the LEDs do not illuminate when powered then check the polarity of the power supply.

The power supply LEDs will illuminate if the three power rails (VIN, 5V and 3.3V) are powered correctly. If any of these LEDs do not illuminate, there are three jumpers on the board that allow the user to isolate the power rails (VIN, 5V and 3.3V). The user can check for short on the power rails and insert an ammeter to monitor the current usage on those power rails.

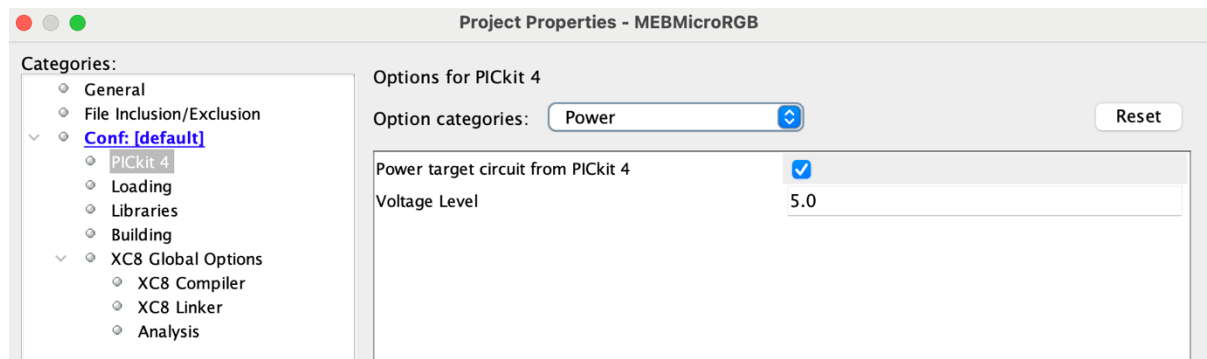


Programming port

The programming port conforms to the PICKit 3 standard and is compatible with PICKit4 and PICKit5. The top pin should be aligned with the arrow on the PICKit.

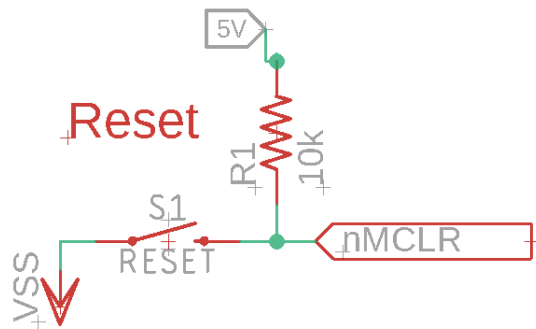


It is possible to power the board via the PICKit but this would not be able to power accessories. This needs to be enabled in MPLab project properties.



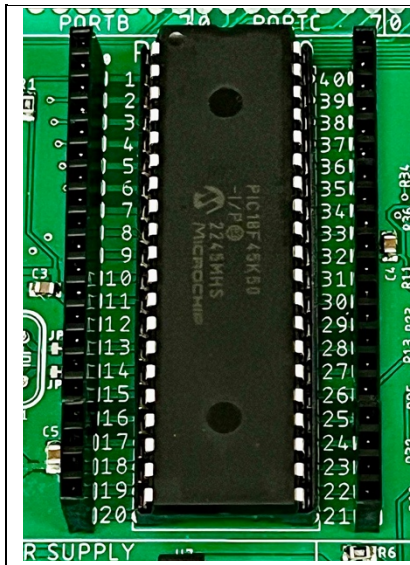
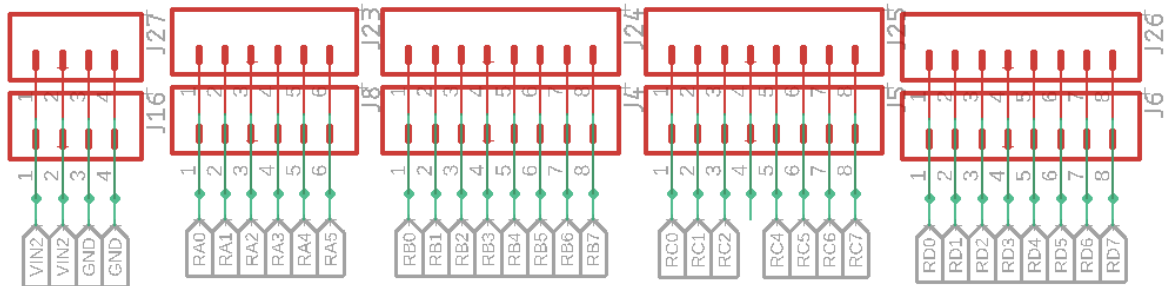
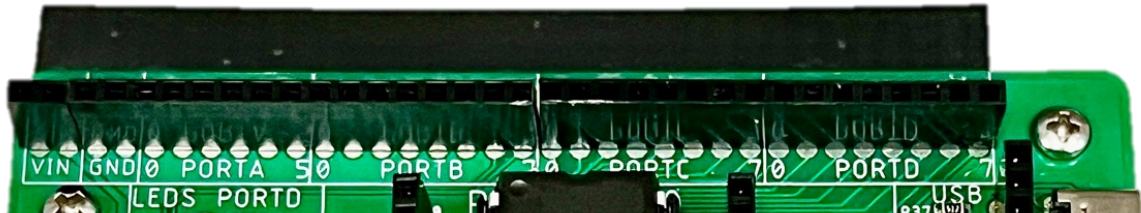
Reset

The reset button is connected to the master clear pin on the PIC. Pressing the reset button will reset the program counter on the PIC to 0.



Ports

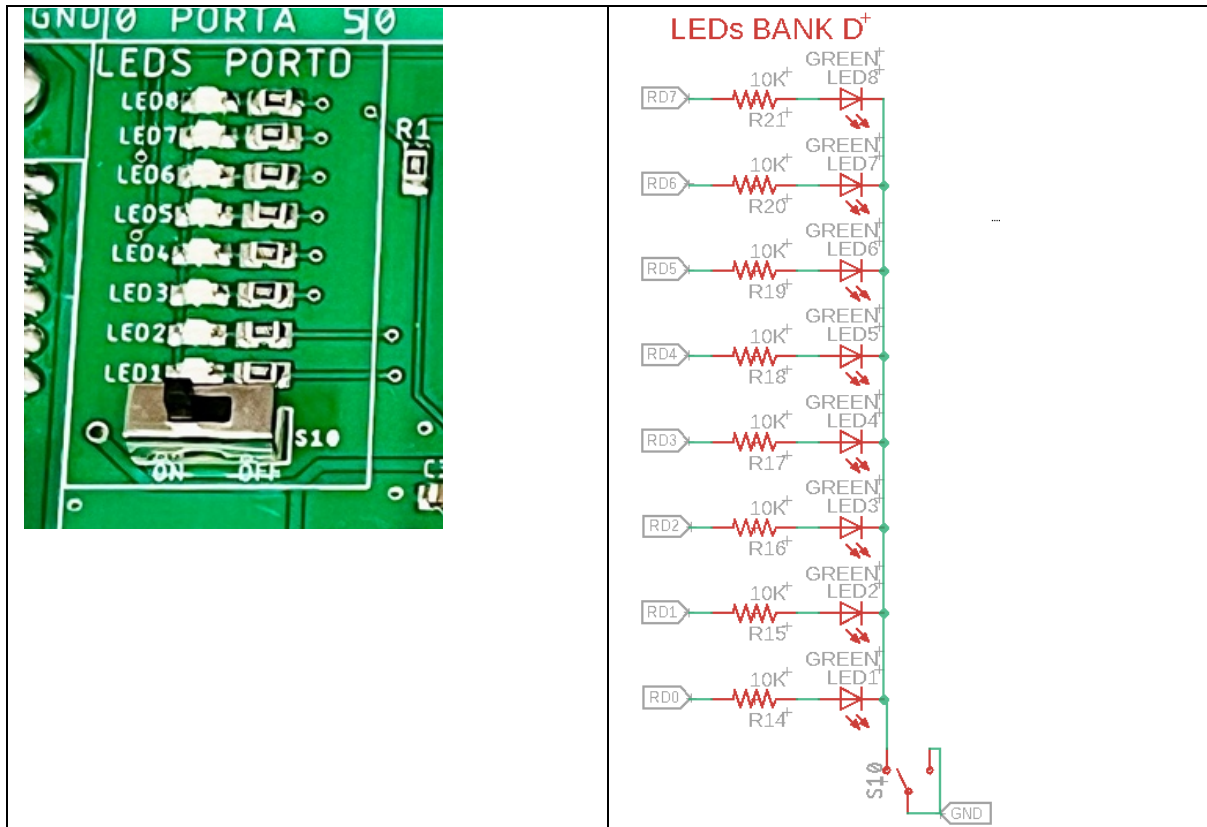
There are three sets of ports, the PIC microcontroller breakout, the vertical port and the top port. All of the ports are directly connected to the PICs GPIO and the VIN on the power supply. The top port is specifically designed to attach the modular add-on boards.



MCLR/PP/RE3	1	40	RB7
RA0	2	39	RB6
RA1	3	38	RB5
RA2	4	37	RB4
RA3	5	36	RB3
RA4	6	35	RB2
RA5	7	34	RB1
RE0	8	33	RB0
RE1	9	32	Vdd
RE2	10	31	Vss
VDD	11	30	RD7
VSS	12	29	RD6
RA7	13	28	RD5
RA6	14	27	RD4
RC0	15	26	RC7
RC1	16	25	RC6
RC2	17	24	D+
USB3V3	18	23	D-
RD0	19	22	RD3
RD1	20	21	RD2

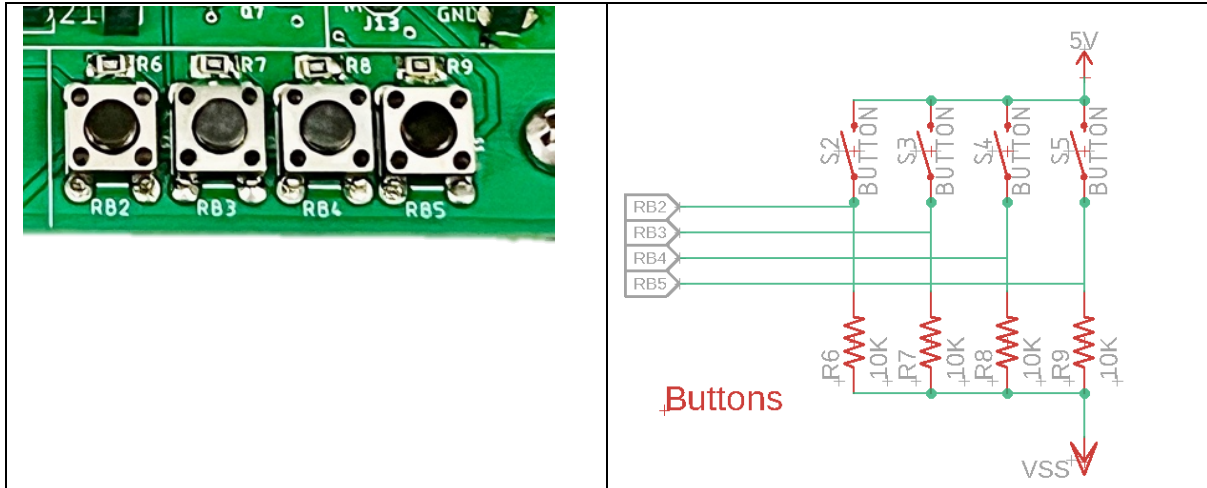
LEDs

The on-board LEDs allow the user to display LED patterns or data output. They are connected to PORTD and can be disabled using the switch below the LEDs.



Buttons

The buttons enable the user to provide a physical input for their project. Each button is active high and pulled down to ground. This pulldown may need to be considered as it may affect any accessories plugged into the GPIO. The buttons are connected to the PIC pins labelled below each button.

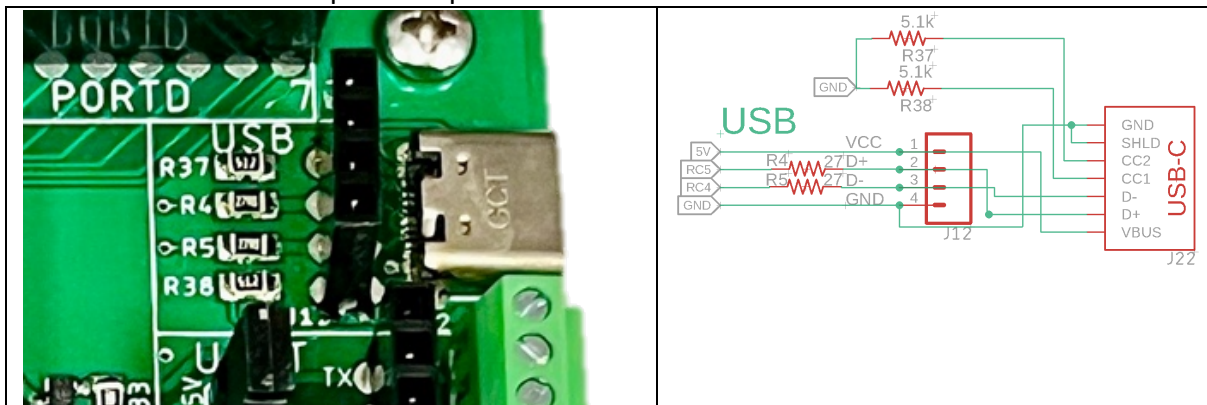


Communications

The boards contain ports for USB, UART, SPI and I2C.

USB

The USB port uses a USB-C connector which works both ways and can be used for power as well as communications. The 27 ohm resistors (R4 and R5) protects the PIC microcontroller from too much current. The 5.1K resistors (R37 and R38) tell the power source that a higher current can be enabled up to 3Amps.



UART/SPI/I2C

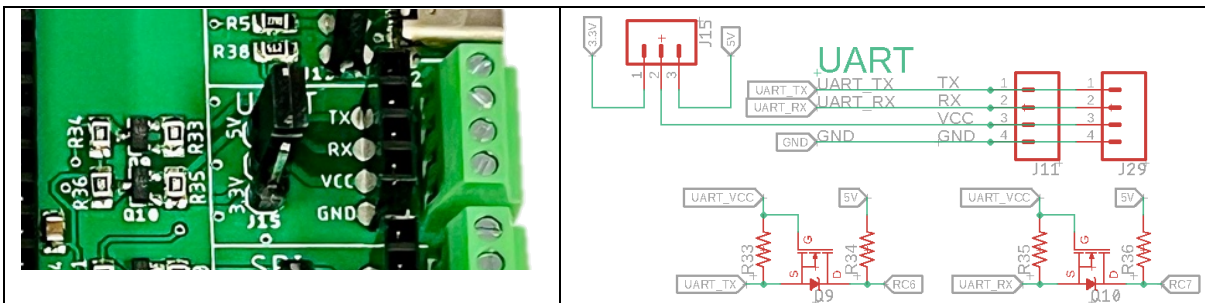
The UART and SPI ports use a screw terminal which allows any wires or pins to be inserted and tightly screwed down. There is also a female header which allows for pins or flying leads to be connected so that signals can be analysed by a logic analyser or oscilloscope. These can also be used to connect the accessory to the board.

UART, SPI and I2C can be 3.3V or 5V. This can be selected by moving the jumper (J15) to connect the middle pin to 3.3V or 5V. The groups of resistors and transistors that can be seen beside the UART port allow 3.3V devices to communicate with the 5V PIC microcontroller.

UART

Transmit is connected to RC6

Receive is connected to RC7



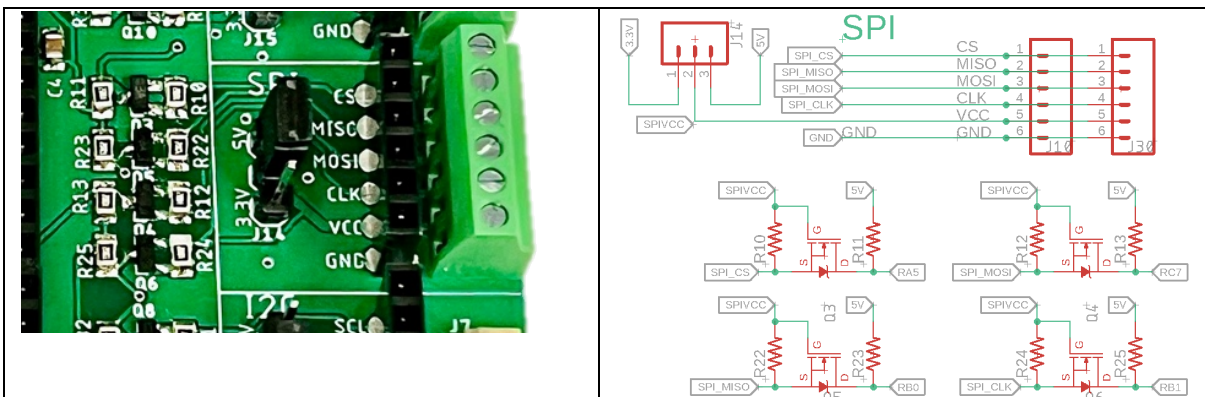
SPI

CS is connected to RA5

MISO is connected to RB0

MOSI is connected to RC7

CLK is connected to RB1



I2C

The I2C port use a QWIIC 4-pin 1mm JST terminal which allows any QWIIC accessories to be connected to the board. There is also a female header which allows for pins or flying leads to be connected so that signals can be analysed by a logic analyser or oscilloscope. These can also be used to connect the accessory to the board.

Most QWIIC accessories are 3.3V. Check the manual for the accessory. If this is the case, ensure that J13 is in the 3.3v position.

