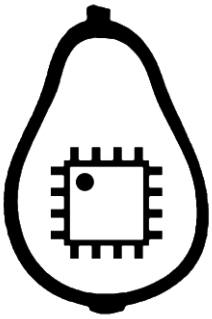


PICado

PICado Alpha 2
Development Board V1.0

Bluetooth Transceiver Module HC-05
Four onboard FET power output stage
34 freely assignable I/O pins
ICSP interface

Table of Contents

1. Introduction

1.1. Introduction

Thank you for purchasing the PICado Alpha 2 Development Board from PICado.
The PICado Alpha 2 Development Board is a simple microcontroller board with the big capabilities of Microchip's 8-bit, 80-pin PIC18F7822 microcontroller combined with the HC-05 Bluetooth Module.
The PICado Alpha 2 Development Board can be used stand-alone with a programmed part, with an in-circuit emulator (for example, MPLAB® REAL ICE™) or with an in-circuit programmer/debugger (such as MPLAB® ICD 3 or PICkit™ 3).

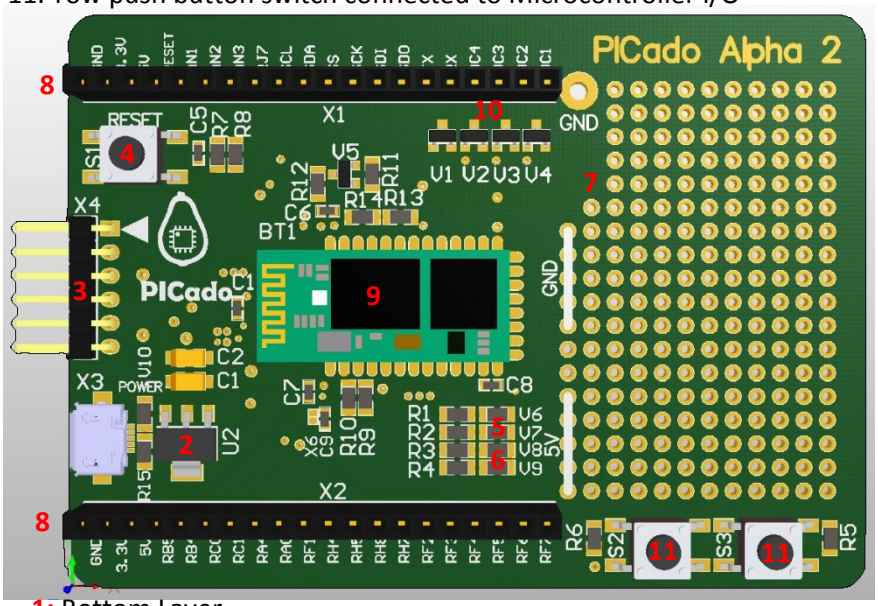
1.2. Development Kit Contents

The PICado Alpha 2 Development Board comes with the following:
• PICado Alpha 2 Development Board

1.3. PICado Alpha 2 Development Board

The PICado Alpha 2 Development Board has the following hardware features:

1. 80-pin TQFP socket PIC Microcontroller (PIC18F8722*/ PIC18LF8722/PIC18F8723) *default
2. On-board, +3.3V regulator for direct input from 5V Micro-USB wall adapter or 5V regulated DC supply
3. Programmer/debugger connectivity supporting PICkit 3 (with adapter also MPLAB ICD 3 and MPLAB REAL ICE)
4. One push button switch for external Reset
5. Tow Status indicator LED connected to HC-05 Bluetooth module
6. Tow LEDs connected to Microcontroller
7. Prototype area for user hardware
8. Expansion Header for PICado expansion Board or user access to MCU pins
9. Onboard HC-05 Bluetooth module
10. Four onboard FET power output stage
11. Tow push button switch connected to Microcontroller I/O



1: Bottom Layer

1.4. Sample Programs

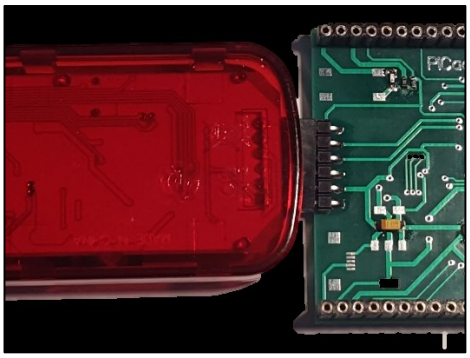
The PICado Alpha 2 Development Board sample demonstration programs can be found on the PICado web site (www.picado.ch/samplecode). These programs may be used with the included default PIC and with a PICkit™ 3 (programmer/debugger). Demo source code are provided.

2. Getting Started

2.1. Programming the Device

The PICado Alpha 2 Development Board supports the ability to program a device through multiple options.

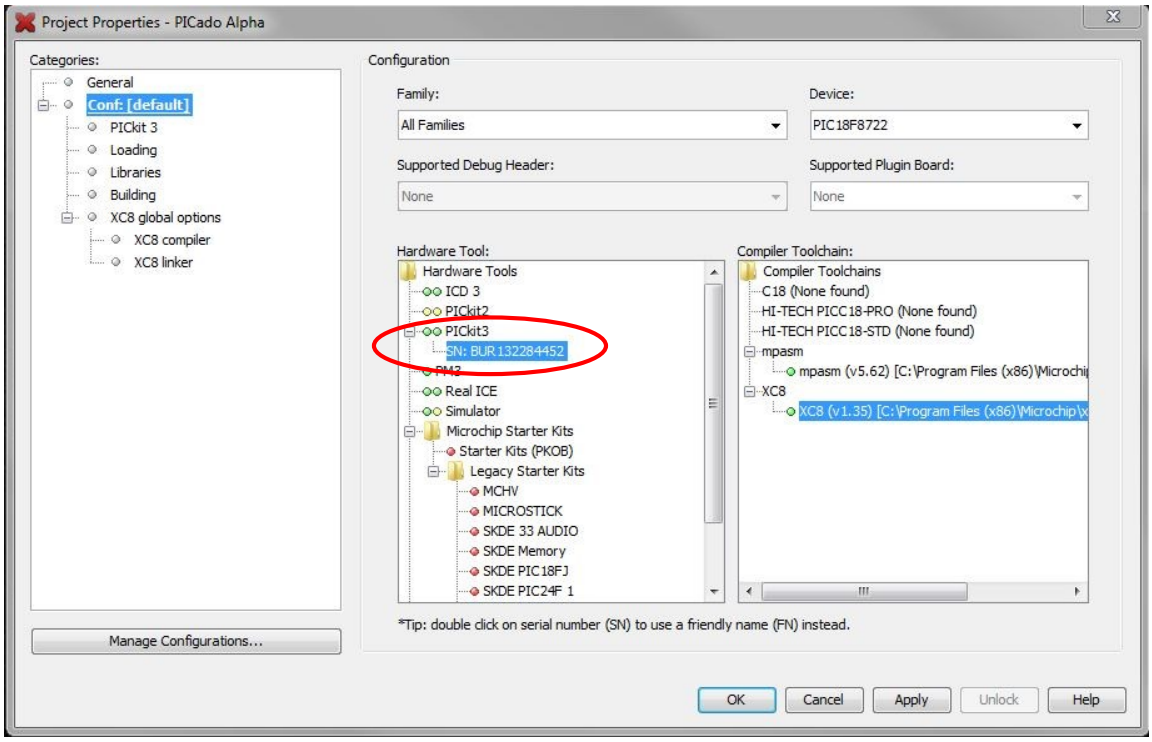
2.1.1. PICkit Programming



Microchip's PICkit 3 In-Circuit Debugger/Programmer uses in-circuit debugging logic incorporated into each chip with Flash memory to provide a low-cost hardware debugger and programmer.

Connecting the PICkit programmer to the PICado Alpha 2 Development Board is quick and easy.

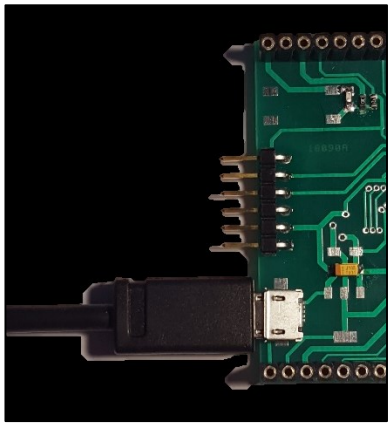
- First connect the PICkit 3 as shown in the figure above.
- Make sure to connect the USB cable to the PICkit 3 and to the computer.
- Enter MPLAB X and go to the Project Properties. Select the PICkit 3 as shown in the figure below.



2.2. Powering the Board

The PICado Alpha 2 Development Board supports the ability to power the board through multiple options.

2.2.1. External 5V USB Connector

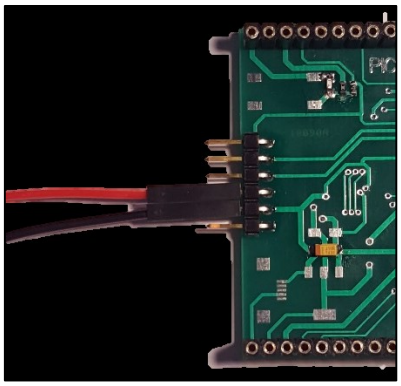


The PICado Alpha 2 Development Board can be powered with an external 5V micro USB power supply.

- Connect 5V micro USB power supply to a wall outlet.
- Connect to board as shown in the figure above. The on-board regulator will reduce the input voltage to 3.3V for safe operation.

To power over USB see the hardware modifications at 4. Schematics.

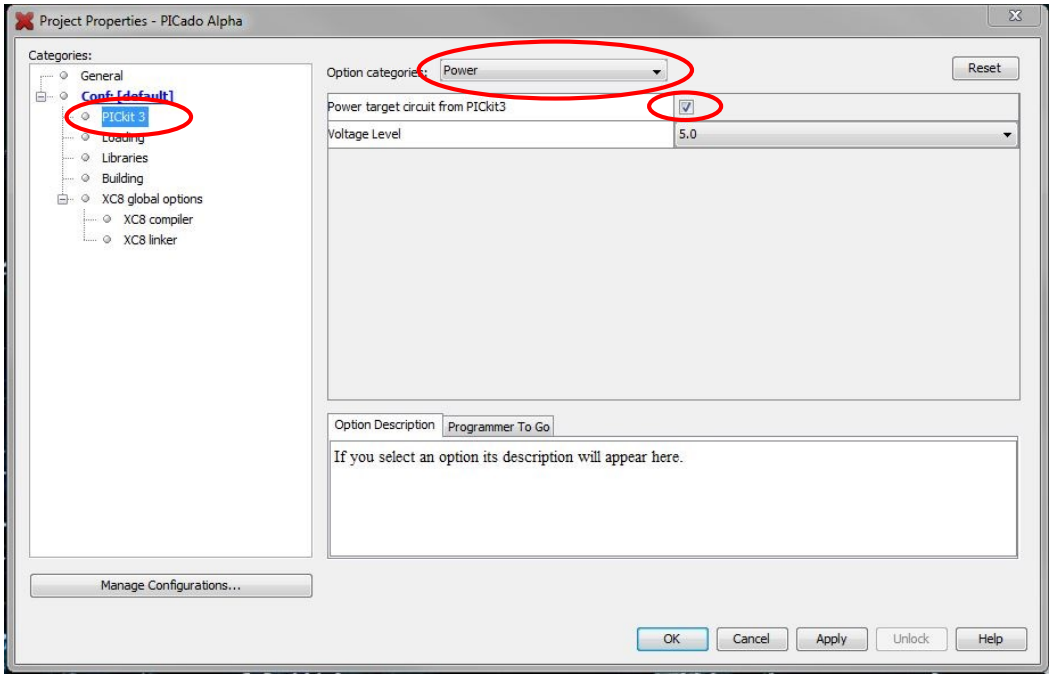
2.2.2. External 5V Connector to programmer pins



The PICado Alpha 2 Development Board can be powered with an external 5V power supply connected to the programmer pins.

- Connect to board as shown in the figure above. The on-board regulator will reduce the input voltage to 3.3V for safe operation.

2.2.3. Power by Programmer



The PICado Alpha 2 Development Board can also be powered with a PICkit or ICD programming device.

- To power the device with a programmer enter MPLAB X and go to the Project Properties.
- Select the PICkit 3 and choose the Option category “Power”.
- Click the checkbox labeled “Power target circuit from PICkit3”. Select 5V as the voltage.
- The board will now be powered through the programmer.

3. Hardware Detail

3.1. Processor (PIC18F8722)

On the PICado Alpha 2 Development Board it has the ability to install different Microcontrollers. The default Microcontroller is the PIC18F8722.
It can also be used without hardware changes following devices:

- PIC18LF8722
- PIC18F8723
- PIC18LF8723

For use of 3.3V devices as follows, you will see in this chapter “Hardware modifications for 3.3V Devices”

- PIC18(L)F87k22
- PIC18(L)F87k23

3.2. Bluetooth Module HC-05

HC-05 embedded Bluetooth serial communication module has two work modes: order-response work mode and automatic connection work mode. And there are three work roles (Master, Slave and Loopback) at the automatic connection work mode. When the module is at the automatic connection work mode, it will follow the default way set lastly to transmit the data automatically. When the module is at the order-response work mode, user can send the AT command to the module to set the control parameters and sent control order. The work mode of module can be switched by controlling the module PIN (PIO11) input level.

For details and commands see the datasheet.

3.3. Four FET power output stage

Four IRFML8244TRPBF N-channel FET used as power output stage.
The power output stages can switch up to 2.5A each. (Absolute Maximum Rating = 3A)

For details see the datasheet and schematic.

3.4. Switch

The switches provide the following functions:

- S1 – MCLR to hard reset the processor
- S2 – connected to microcontroller pin RD3
- S3 – connected to microcontroller pin RD2

Switch S1 has debounce capacitors. When pressed, the switch is grounded. When idle, he is pulled high (+5V).
Switch S2 and S3 has no debounce capacitors. When pressed, the switch is grounded. When idle, he is pulled high (+5V).
For details see the datasheet and schematic.

3.5. LEDs

Four CGKCH005 LEDs, 2 connected to the Microcontroller and 2 connected to the HC-05 Bluetooth Module.
Another CGKCH005 LED shows the power Status of the whole board.

For details see the datasheet and schematic.

3.6. Voltage Regulator

The LM1117 is a low dropout voltage regulator with a dropout of 1.2V at 800mA of load current. It has the same pin-out as Texas Instruments' industry standard LM317.

- Current Limiting and Thermal Protection
- Output Current 800mA
- Line Regulation 0.2% (Max)
- Load Regulation 0.4% (Max)

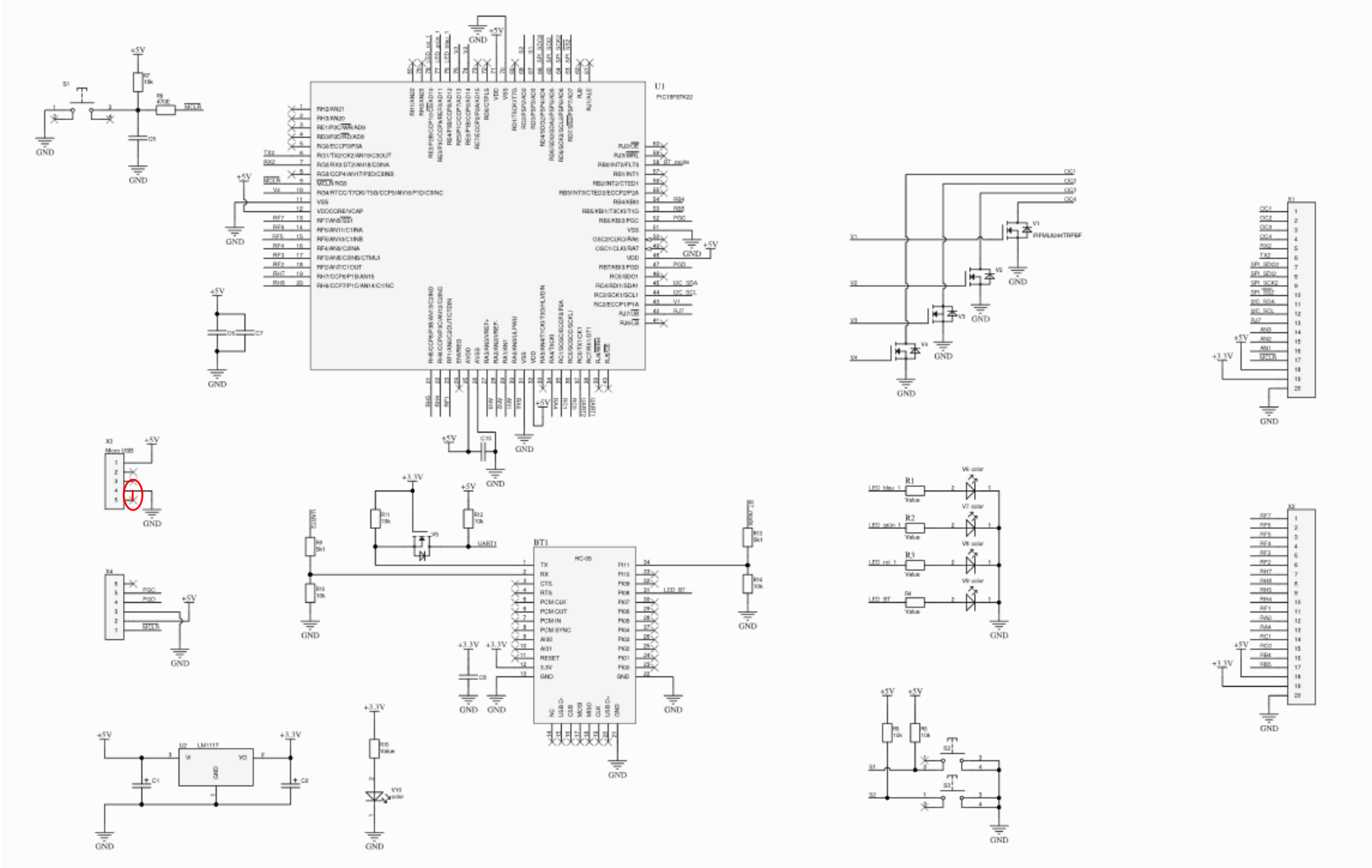
For details see the datasheet and schematic.

3.7. Pin Header

X1		X2	
OC1	1	1	RF7
OC2	2	2	RF6
OC3	3	3	RF5
OC4	4	4	RF4
RX2	5	5	RF3
TX2	6	6	RF2
SPI SDO 2	7	7	RH7
SPI SDI 2	8	8	RH8
SPI SCK 2	9	9	RH5
SPI SS2	10	10	RH4
I2C SDA	11	11	RF1
I2C SCL	12	12	RA0
RJ7	13	13	RA4
AN3	14	14	RC1
AN2	15	15	RC0
AN1	16	16	RB4
MCLR	17	17	RB5
5V	18	18	5V
3.3V	19	19	3.3V
GND	20	20	GND

For details see schematic.

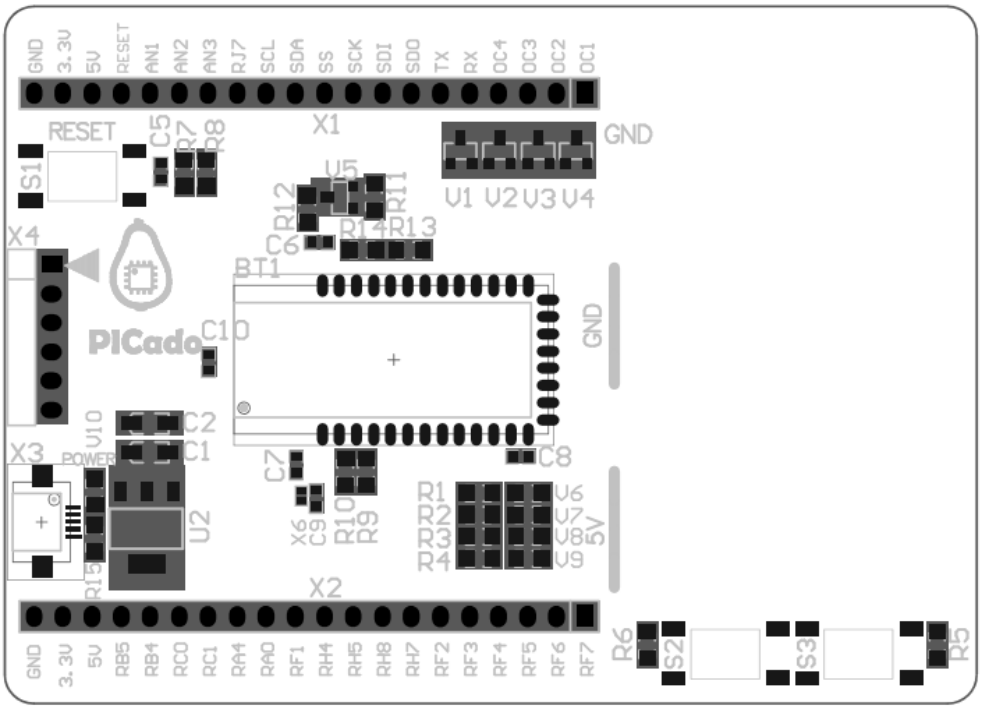
4. Schematic



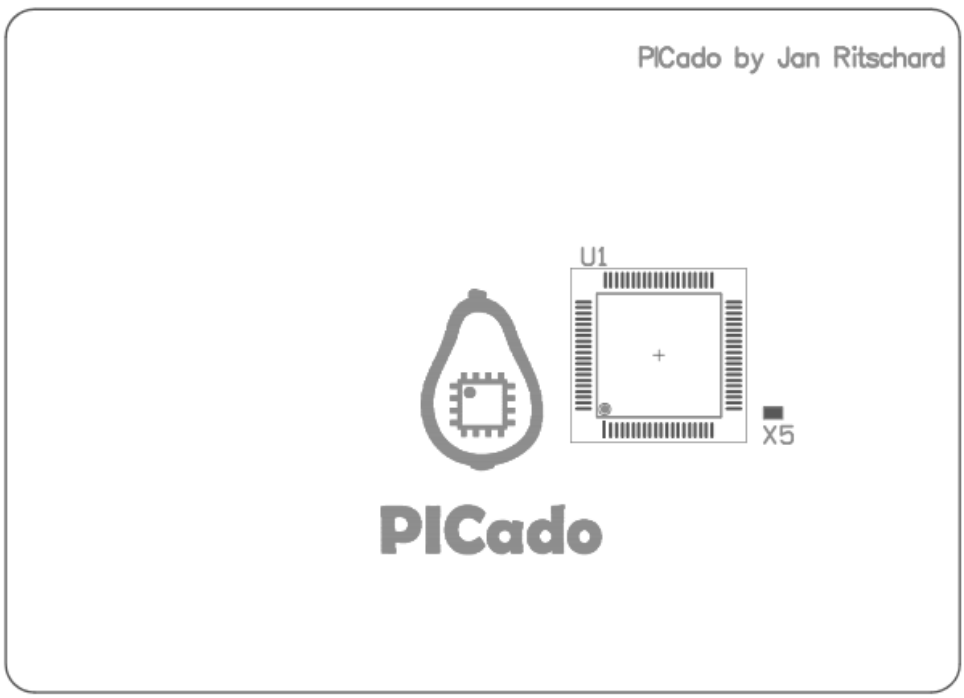
To use the PICado Alpha 2 as a 5V board you must short X6 and the tow pins of the X2.

5. Assembly Drawings

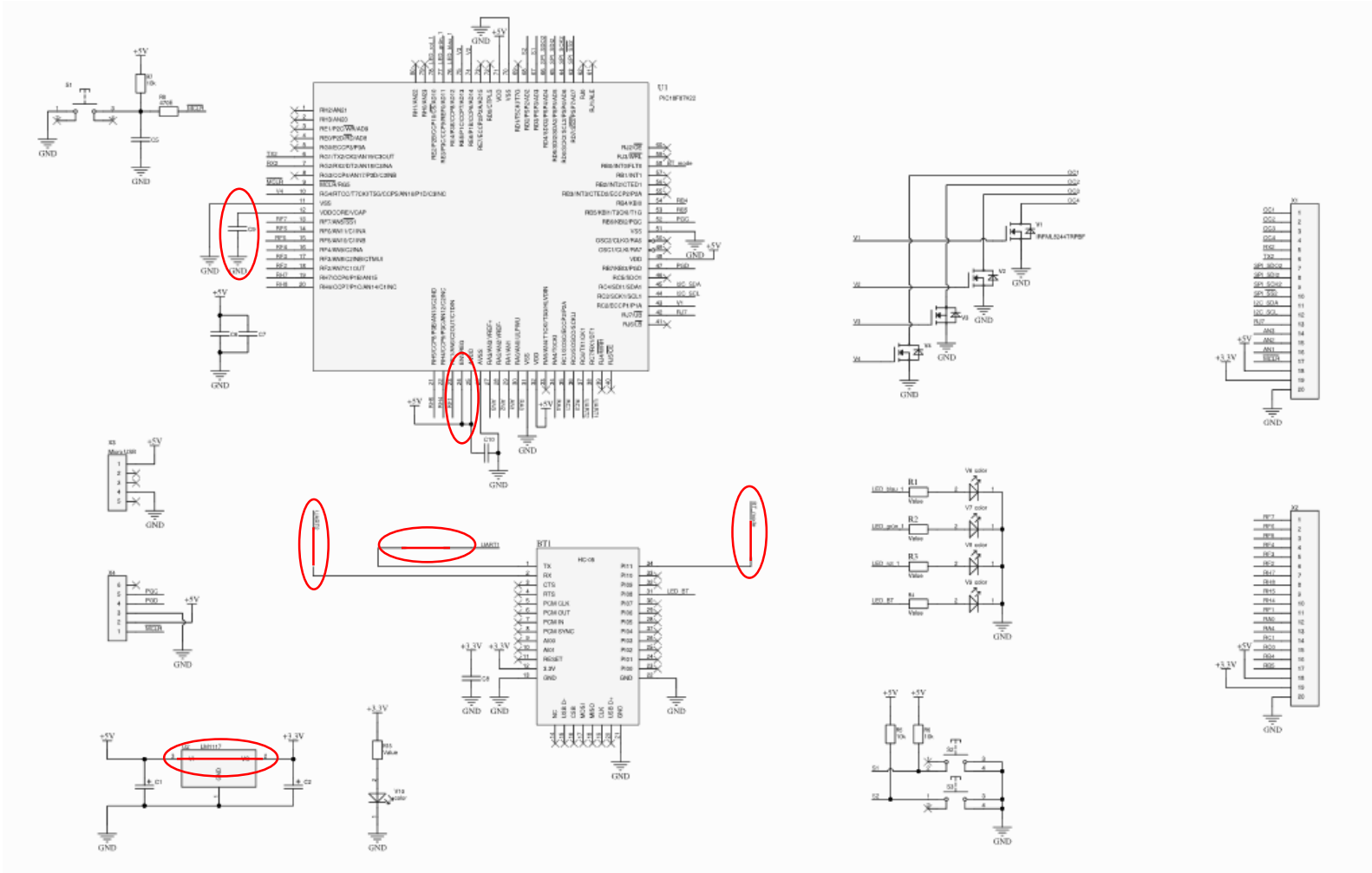
5.1. Top Layer:



5.2. Bottom Layer:



6. Hardware modifications for 3.3V Devices



To use the PICado Alpha 2 as a 3.3V board you must short R9, R13, V5, X5, U2 and open X6.
Additionally C1 must be fitted and R10, R11, R12 and R14 must not be fitted.