



*Tiny Go Badge.*

Purple  
Hardware by 

## Features

### Common features

- RP2040 MCU, dual core M0+
- 64Mbit of Flash Quad-SPI
- 1 user Led
- Accel LIS3DHTR sensor
- 2 RGB serial Neopixel compatible
- 6 user buttons
- 12Mhz Oscillator
- IPS TFT Display of 320x240p
- Buzzer and amplifier for sound reproduction
- Board connections:
  - SWDIO
  - USB C, battery charge and data
  - Qwiic/Stemma
  - Solder Pads accessible for expansion purposes
- Work with LiPo and/or with the USB C
- USB C LiPo battery charging
- Community Support of several languages:
  - Tiny Go
  - C/C++
  - Arduino
  - Mbed
  - Micro Python

The tiny go badge is a board inspired by the Gopher pet of Golang in association with the GO community. This board is created with educational purposes focused on the future presentations around the world make by the GO community.



## 1 Pin Demux

To understand how to work with this board the following table will introduce the GPIO and the functionality. This support could be added by the community on the language supported for the board configuration or should be added manually by the user.

Legend		
Display	Generic	External accesible
Buttons	I2C	RGB
PWM	Not in use	

Table 1. Pin Demux

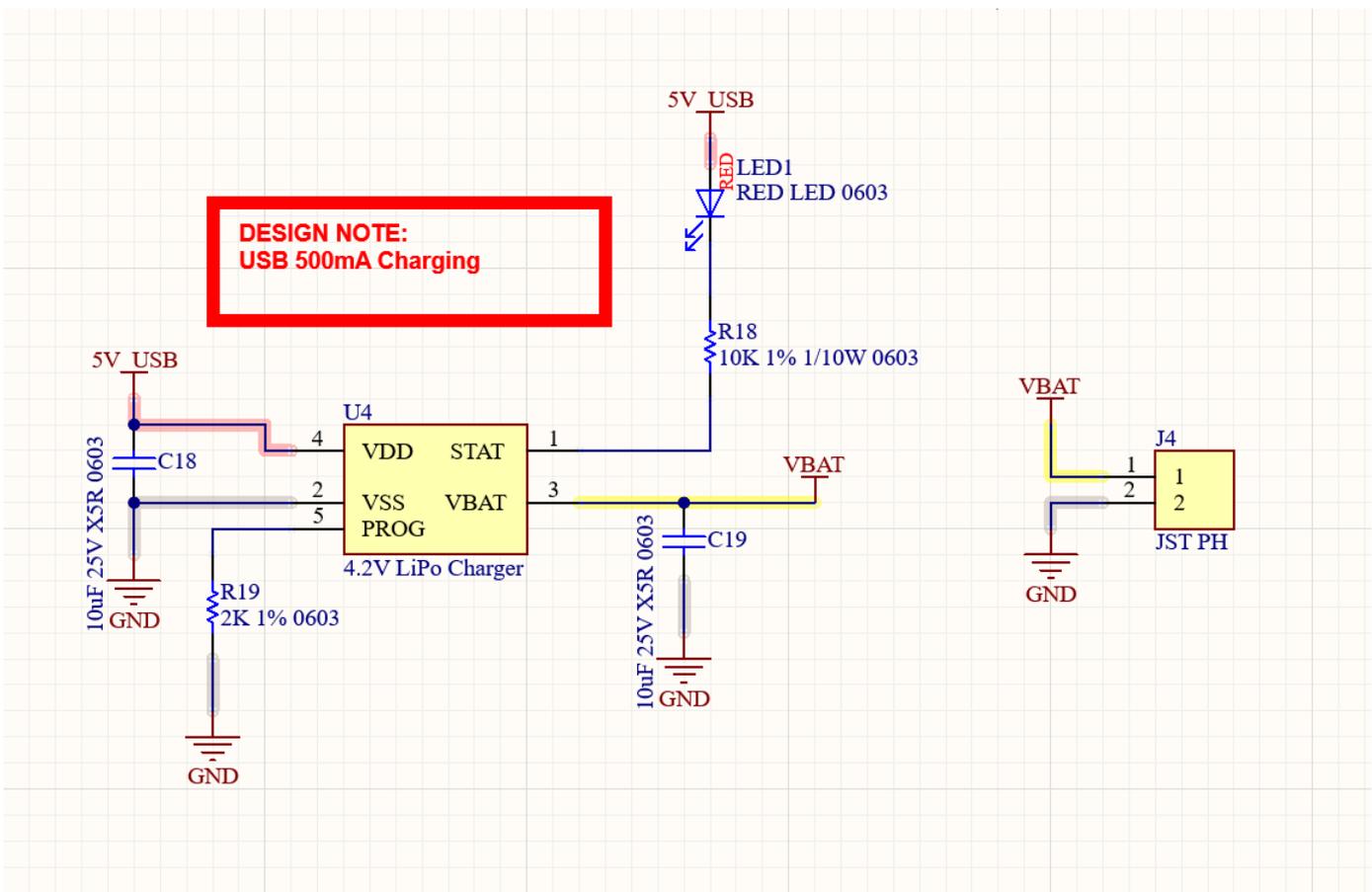
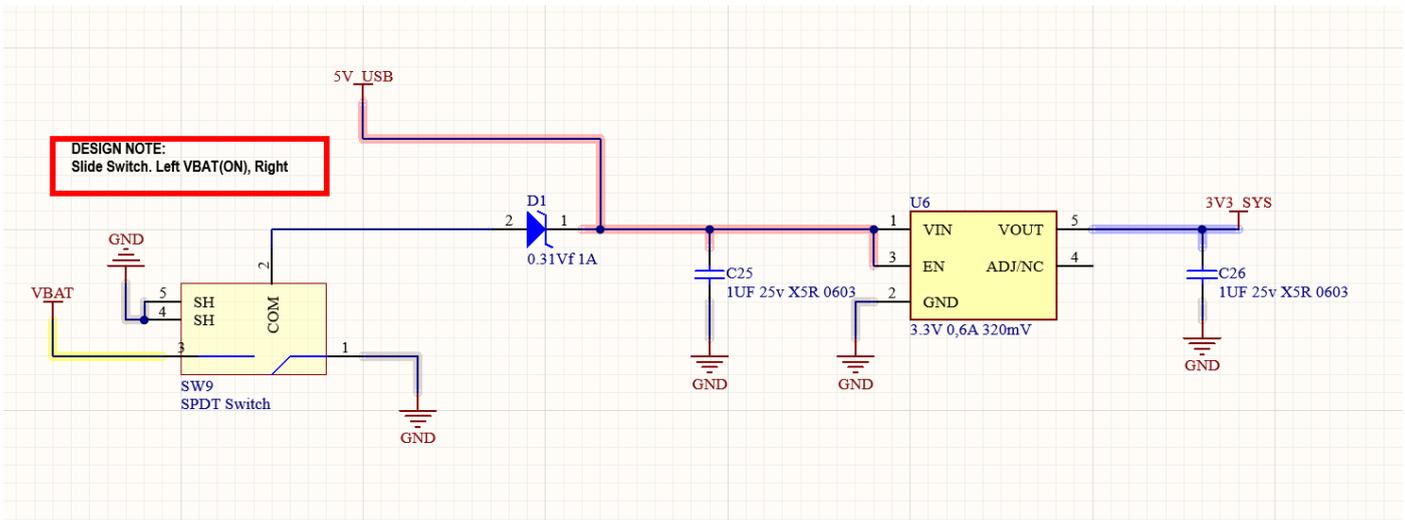
GPIO	Description	Function	Bus/PWM Channel	Voltage level
0	I2C on RP2040	SDA	0	3,3V
1	I2C on RP2040	SCL	0	3,3V
2	User Led	Output		3,3V
3	Amplifier enable control (High enable)	Output		3,3V
4	External acces by "Solder Pads"	Not defined		3,3V
5	External acces by "Solder Pads"	Not defined		3,3V
6	External acces by "Solder Pads"	Not defined		3,3V
7	External acces by "Solder Pads"	Not defined		3,3V
8	External acces by "Solder Pads"	Not defined		3,3V
9	Tearing effect display control	Output		3,3V
10	Input A front button	Input		3,3V
11	Input B front button	Input		3,3V
12	Display Backlight enable (High enable, can be PWM or 0/1 logic)	Output	Channel 6A	3,3V
13	Not in use (PenIRQ with NS2009 resistive controller)	Input		3,3V
14	Analog PMW Sound Output	Output	Channel 7A	3,3V
15	Serial Bus for Neopixel type RGB Led	Serial		3,3V
16	TFT MISO	Output	0	3,3V
17	TFT CS pin	Output		3,3V
18	TFT SPI CLK	Output	0	3,3V
19	TFT SPI MOSI	Output	0	3,3V
20	TFT DC pin	Output		3,3V
21	Reset display (Low reset)	Output		3,3V
22	Input right front button	Input		3,3V
23	Input down front button	Input		3,3V
24	Input up front button	Input		3,3V
25	Input left front button	Input		3,3V
ADC0	External acces by "Solder Pads"	Not defined		3,3V
ADC1	External acces by "Solder Pads"	Not defined		3,3V
ADC2	External acces by "Solder Pads"	Not defined		3,3V
ADC3	Not in use			3,3V

## 2 Schematics

The tiny go badge board it's an open-source board. With this in mind the schematics are open to understanding with educational purposes.

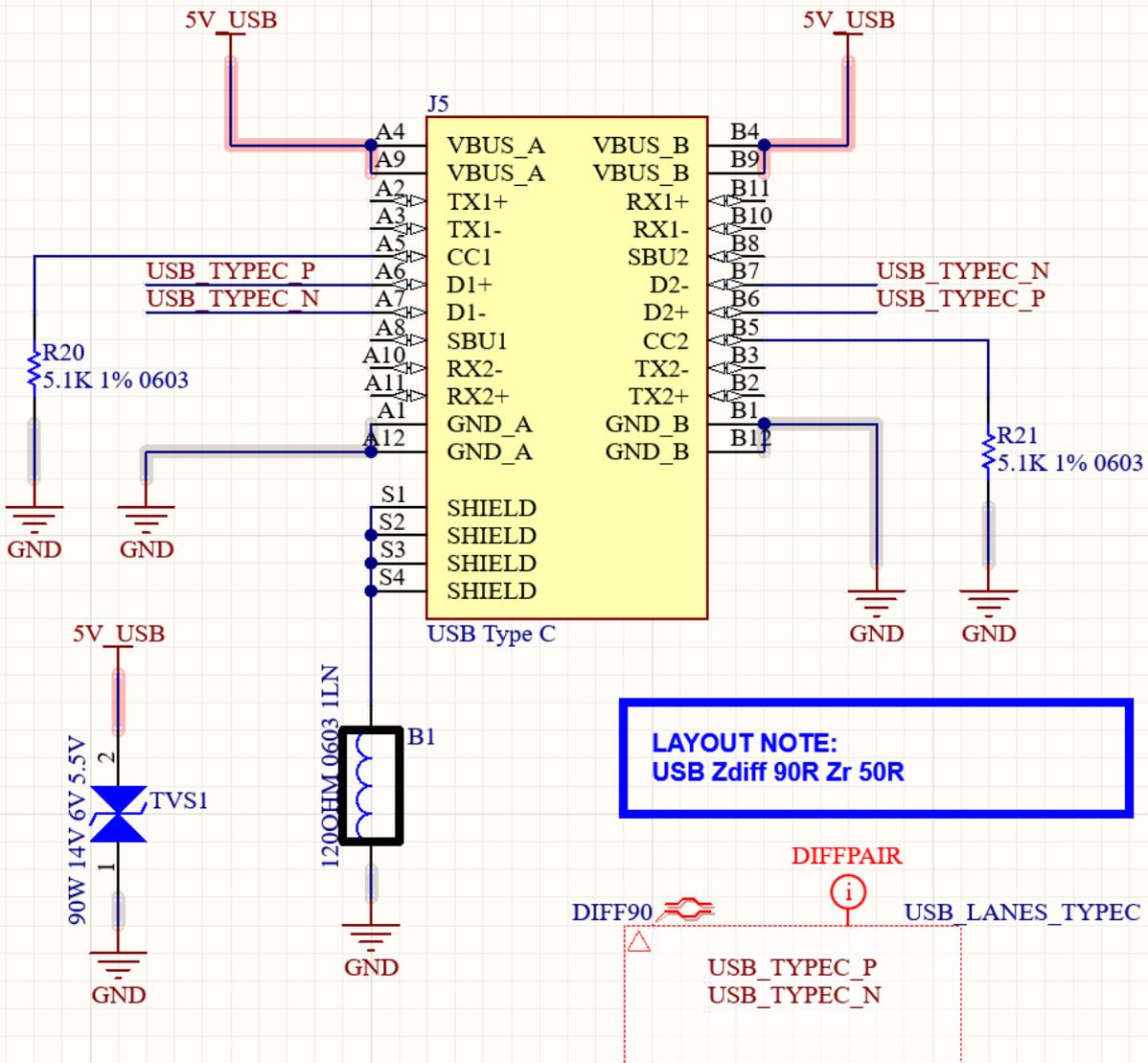
### 2.1 Power

The board can work at the same time with battery and with the USB C connected. If the USB C is connected and the board have a battery connected, this will start the charging process with a maximum charge rate of 500mA.





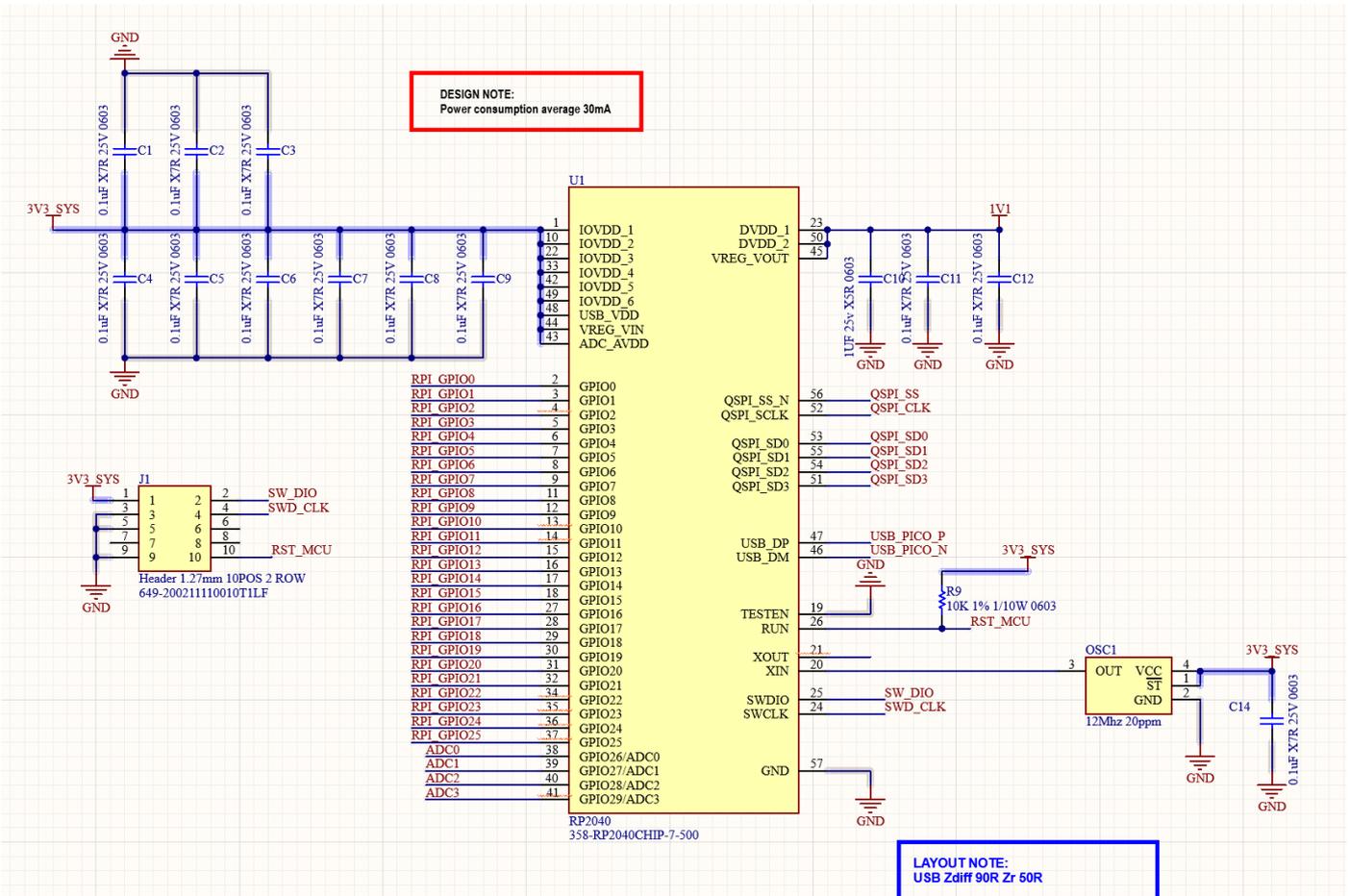
**DESIGN NOTE:**  
CC1 & CC2 PullDown, always 5V compliant.





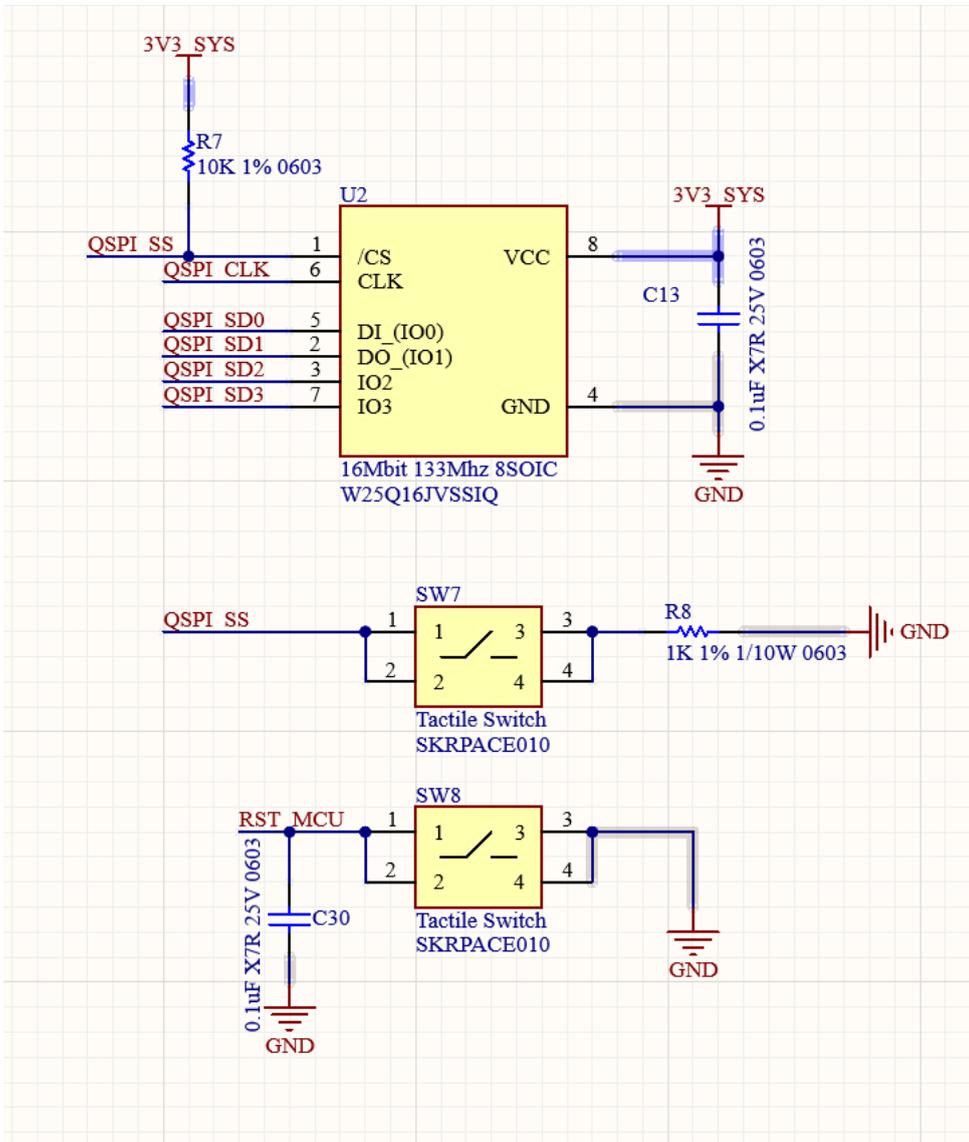
## 2.2 RP2040

The MCU of the board it's a RP2040 from raspberry pi. This MCU have a dual core M0+ capable to run up to 130Mhz. The Tiny Go badge have a 64mbit (8MegaByte) flash memory to store all program contents.





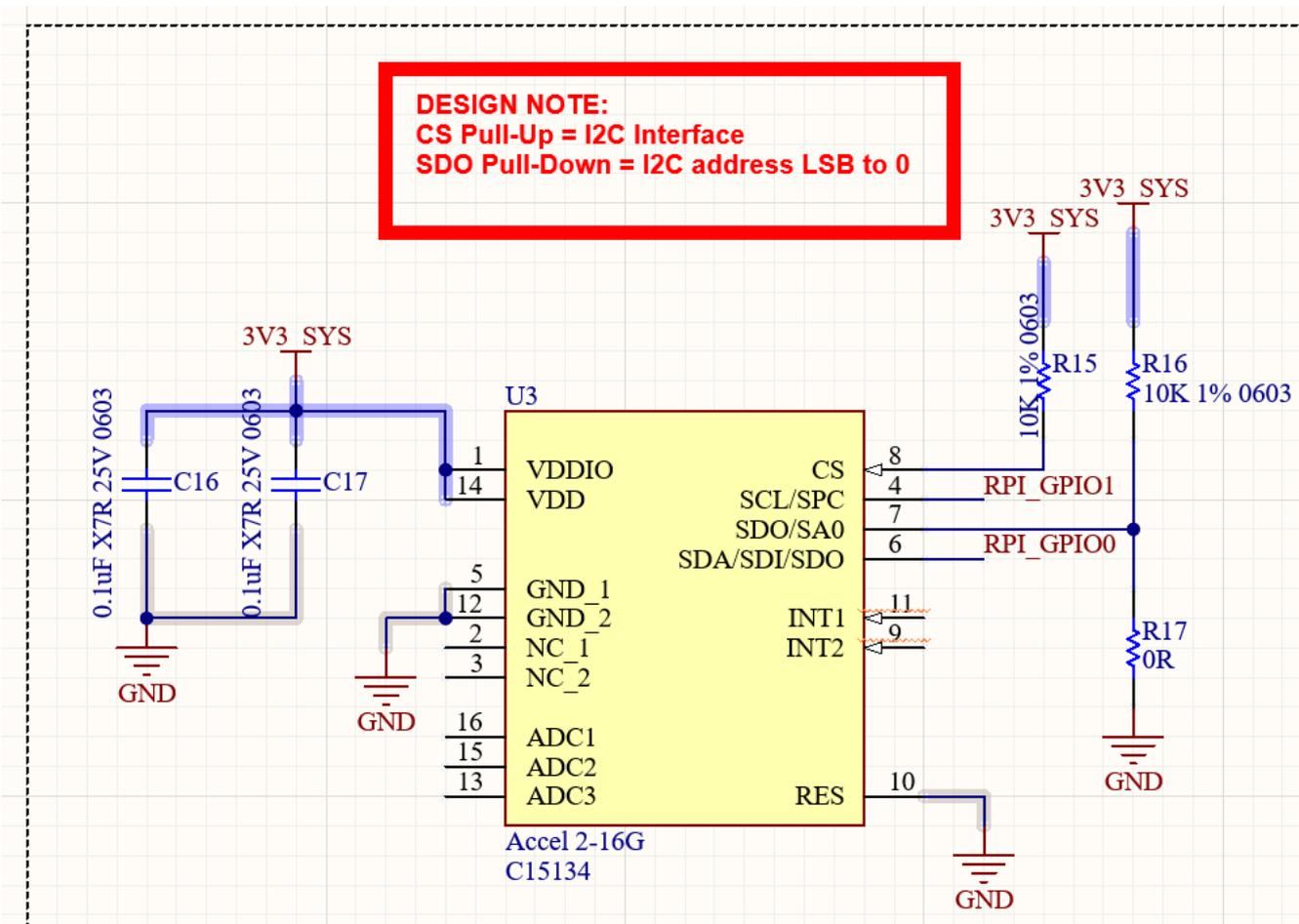
The SPI Flash content is accessible by the RP2040 bootloader if the **Boot** switch (SW7) is pressed at the reset of the board, this reset could be done by a momentary press of the Reset button (SW8).

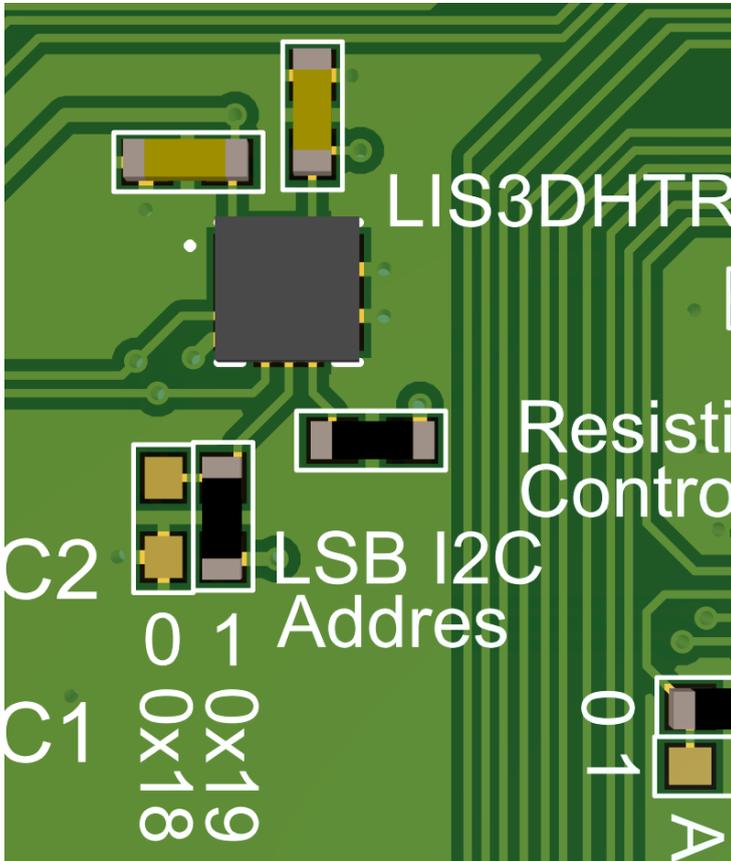




## 2.3 Accel Sensor

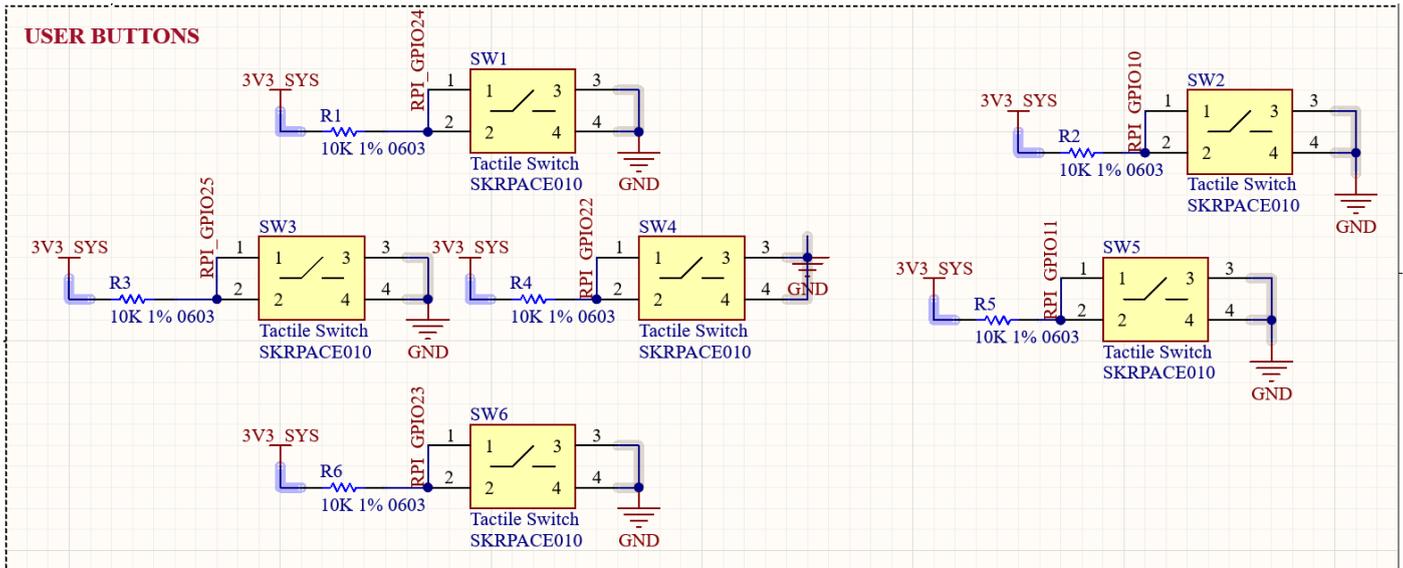
The tiny go badge board have an accelerometer sensor that is accessible by the I2C bus, this sensor it's a well know one by the community the LIS3DHTR. The address of the sensor is editable with solder tools, by default the R17 is soldered on the board, but if the user wants to change the I2C address, it could be done by desolder the R17 and solder the R16. The modification mentioned above its marked on the PCB board silkscreen.





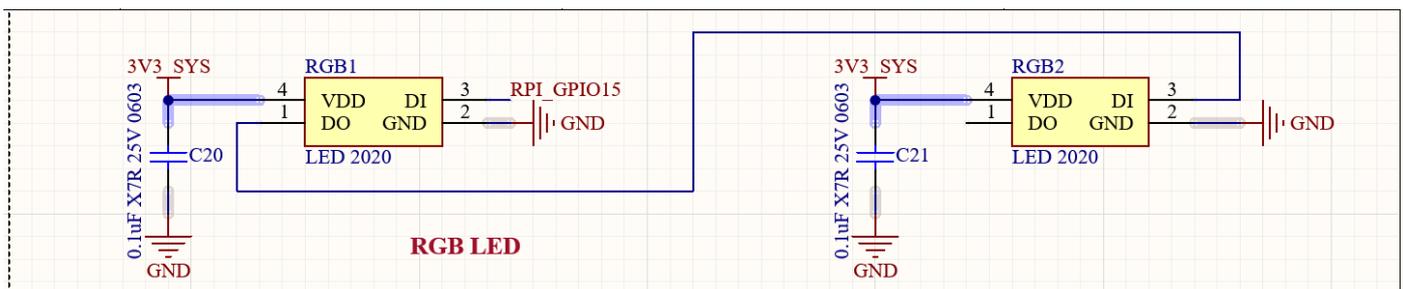
## 2.4 User buttons

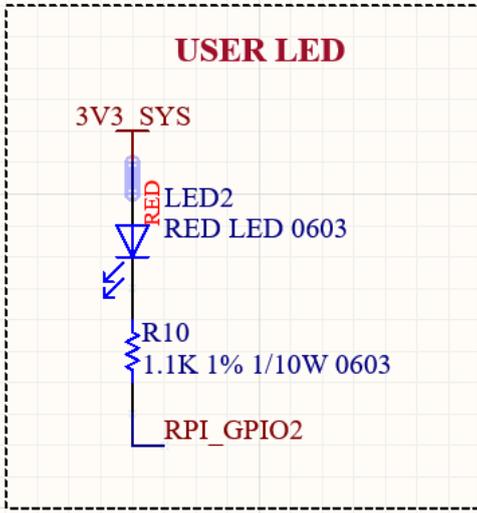
On the board are a total of 6 user buttons, they are allocated in the front. Those buttons have a logic Low activation.



## 2.5 User Led and RGB

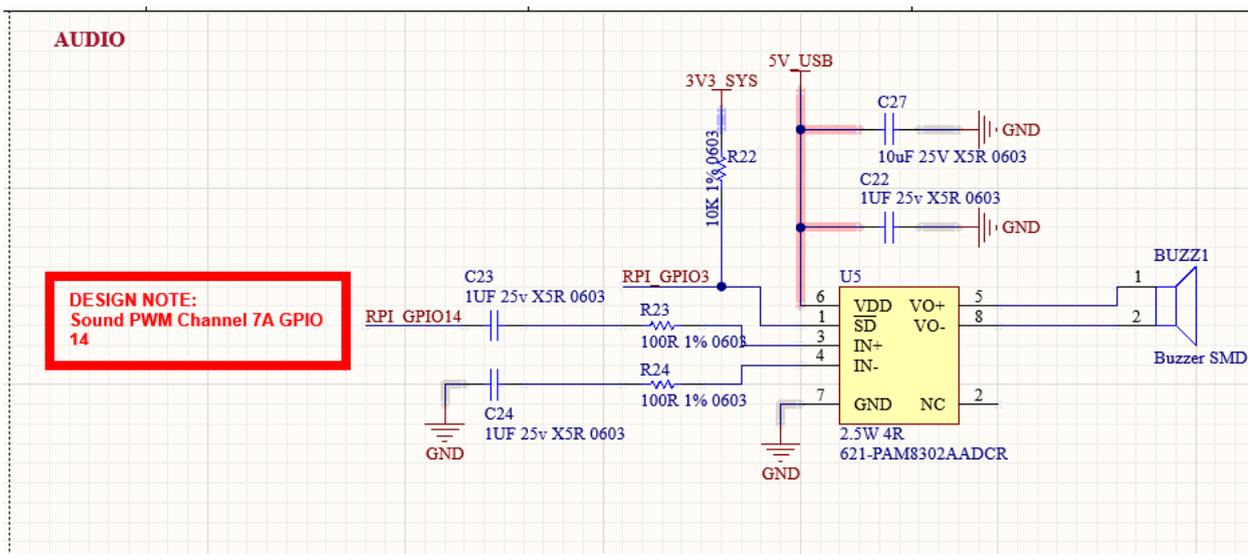
A total of 2 RGB serial Led are allocated in the eyes of the Gopher, and one standard Led its allocated in the back of the board. The RGB LEDs are compatible with the NeoPixel library maintained by the community.





## 2.6 Audio

The tiny go Badge has the ability to play sounds with the help of a buzzer. This sounds must be created by the RP2040 and modulated by PWM.

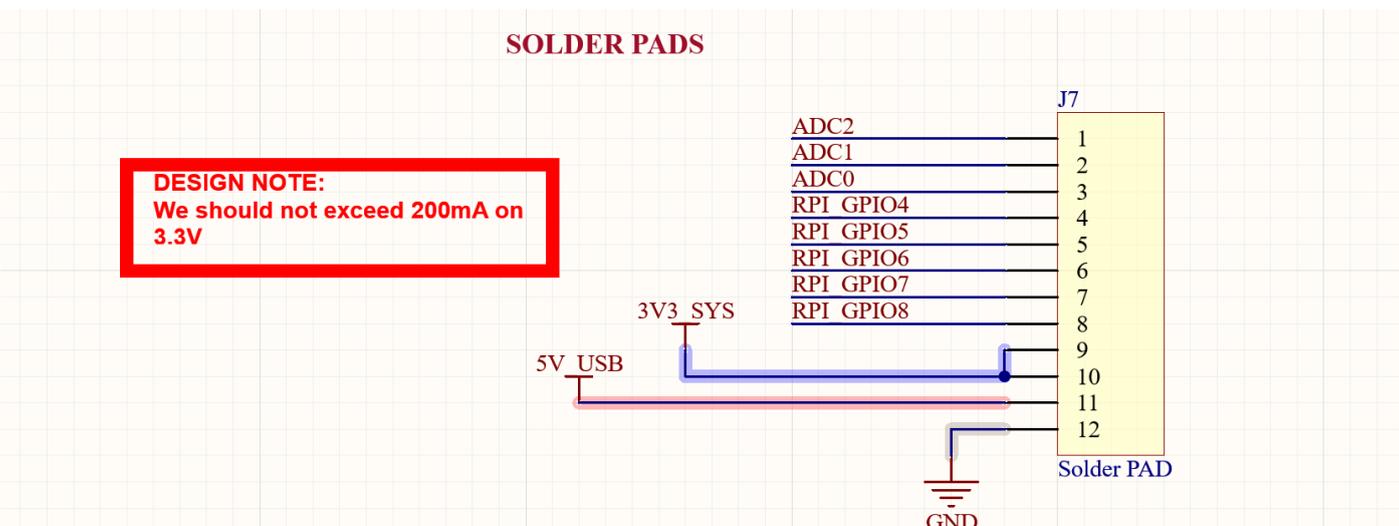
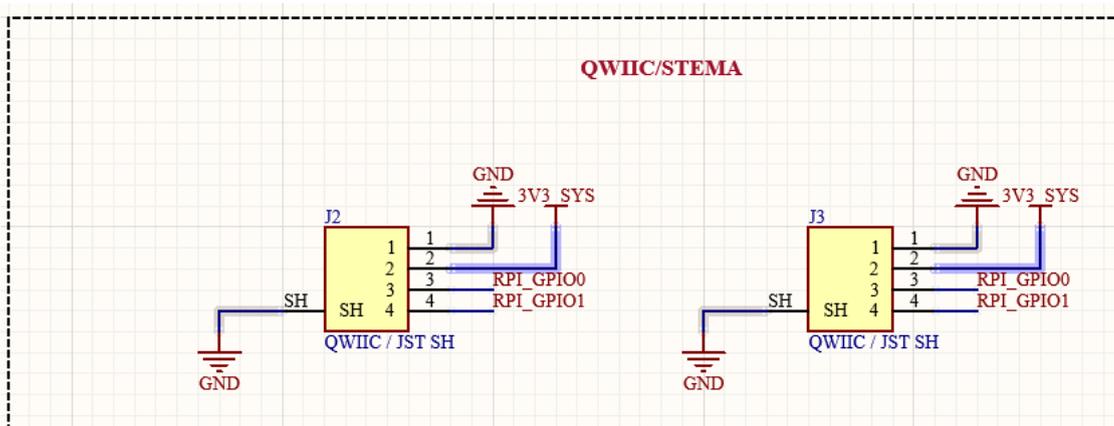




### 2.7 External connectors

This board is compatible with the Qwiic/Stema 3,3V logic connectors. In addition, the user has solder pads exposed for expansion purposes on the board.

Extra caution should be taken in account if the Solder Pads are used, the voltage logic of the board is 3,3V, if this voltage is exceeded, the board will be damaged. If the 3,3V output of the board is used, a maximum draw of 200mA is recommended.





## 2.8 Display

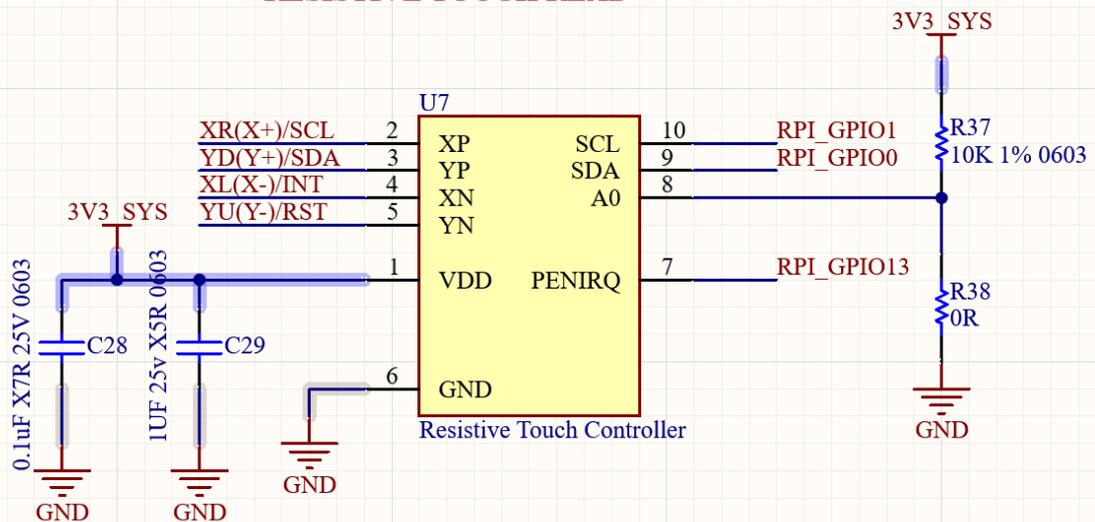
The tiny go Badge board have the ability to drive a SPI TFT display of 50 pins with backlight control. The backlight control could be implemented by a PWM or a logic 1/0.

One extra in the board it's the capability of solder a **NS2009** resistive touch controller, this controller isn't on the scope of this board, but, if the user wants to buy an extra SPI TFT display with resistive touch, the board have the footprint to make it work.

The **NS2009** has an I2C address configurable by R38 and R37, by default the R38 is soldered in the board.

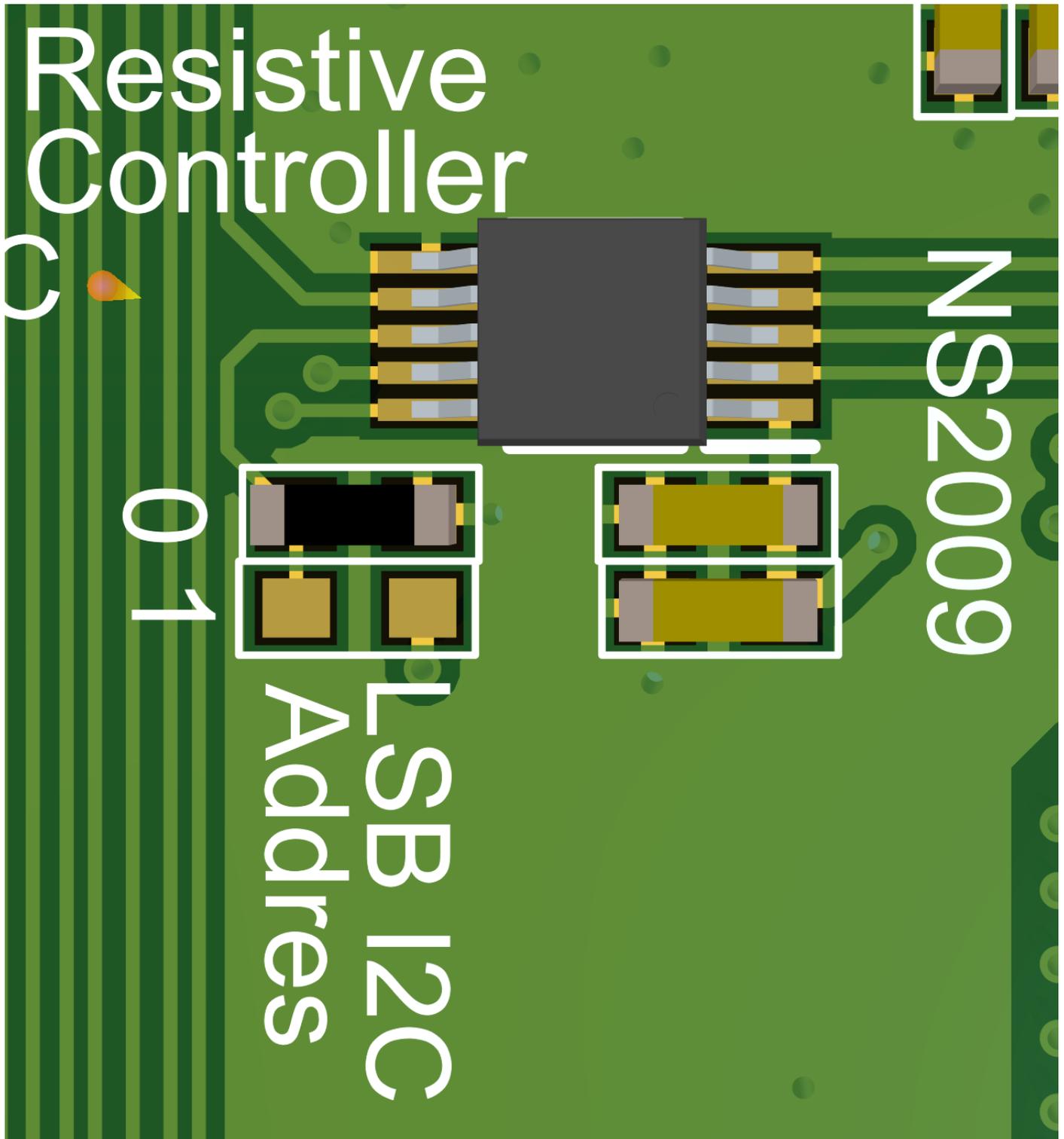
**DESIGN NOTE:**  
Footprint on design, but not mounted.

### RESISTIVE TOUCH READ





The lane on the footprint marks the pin number 1, caution should be taken into account at solder this component, it cannot be reversed.





DISPLAY

**DESIGN NOTE:**  
IM3=1,IM2=1,IM1=1,IM0=0 4wire 8-bit data  
Serial Interface => SCL, SDI, DCX, SDO, CSX  
RST GPIO 21, default ON PULL-UP  
GP16= SPI0RX  
GP19= SPI0TX  
GP20= DC  
GP18= SPICLK  
GP17 = CS

**DESIGN NOTE:**  
Backlight PWM Channel 6A  
GPIO 12. On default ON

**DESIGN NOTE:**  
TE without use.  
Touch without use.

