

**PureControl: DIY-Controller**

17.04.2019

# Information

This manual describes the main steps to build a motion controller by yourself. You have to buy all components by yourself and put everything together. This might be okay for testing and 1 or 2 axis setups, but with more axis, it will get confusing due to the amount of needed connections. But it is the cheapest solution.

If you want a „clean“ solution, you can purchase a complete assembly kit and solder on a custom electronic board. Check out the manual for all needed steps:

[https://downloads.puremoco.com/documents/PureControl\\_Assembly\\_manual.pdf](https://downloads.puremoco.com/documents/PureControl_Assembly_manual.pdf)

If you have a 3D-printer, you can even print the housing by yourself, to save even more.

# Parts

Base components	Component price
1x Teensy 3.6	32 €
1x HM-10 Bluetooth 4.0 Module	12 €
1x 5V voltage regulator (for example LM2596 module)	2 €
1-6x SilentStepStick TMC2130	12 € per driver
2x optocoupler (incl. 150 Ohm resistor)	1€
<b>Android device with Android 5.0 or newer and Bluetooth 4.0 support</b>	

Optional	Component price
1x Mini USB-Host shield	15 €
1x Bluetooth 4.0 USB-dongle	10 €
1x PlayStation 4 controller	55 €

# Firmware

**Latest firmware (choose V3):**

<https://www.puremoco.com/firmware.html>

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**Teensyduino Addon:**

[https://www.pjrc.com/teensy/td\\_download.html](https://www.pjrc.com/teensy/td_download.html)

**Arduino Software (check first if Teensyduino is compatible with latest Arduino version,  
otherwise choose an older version of the Arduino software):**

<https://www.arduino.cc/en/Main/Software>

# Android app

**Google Play Store:**

<https://play.google.com/store/apps/details?id=pm.puremoco.free2>

The version in the Play Store is only a demo version. You are only able to move the X-Axis manually. All other features and functions are disabled. You can purchase the full app if you contact me:

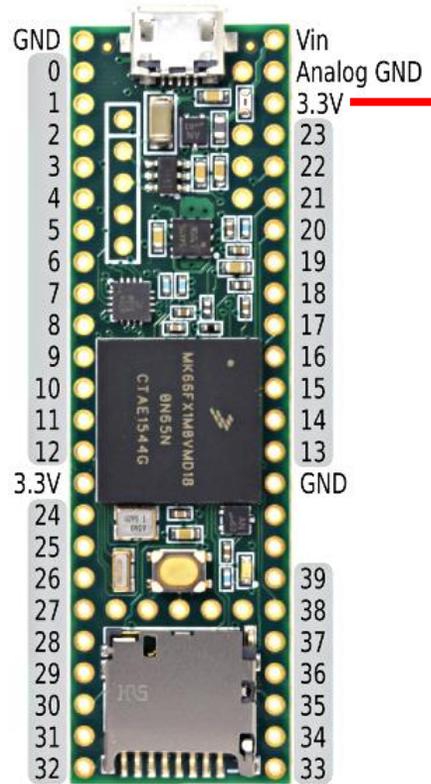
**[info@puremoco.com](mailto:info@puremoco.com)**



**Step 1:**

**HM-10 Bluetooth-module**

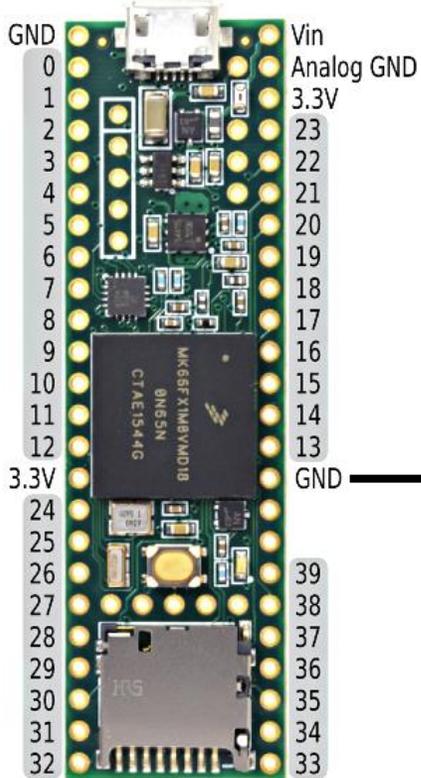
# HM-10 Bluetooth



3.3V ↔ VCC

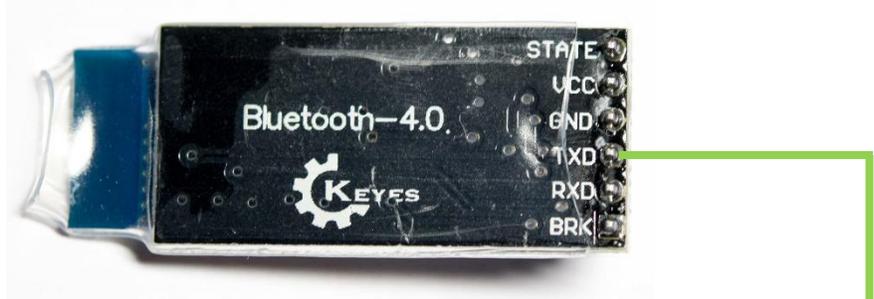
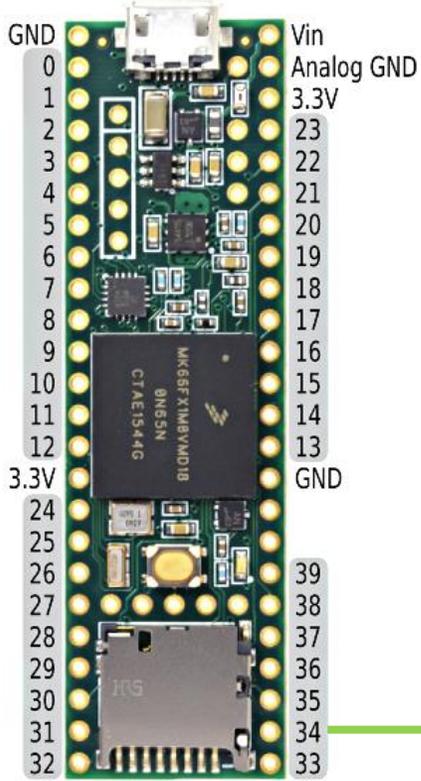


# HM-10 Bluetooth



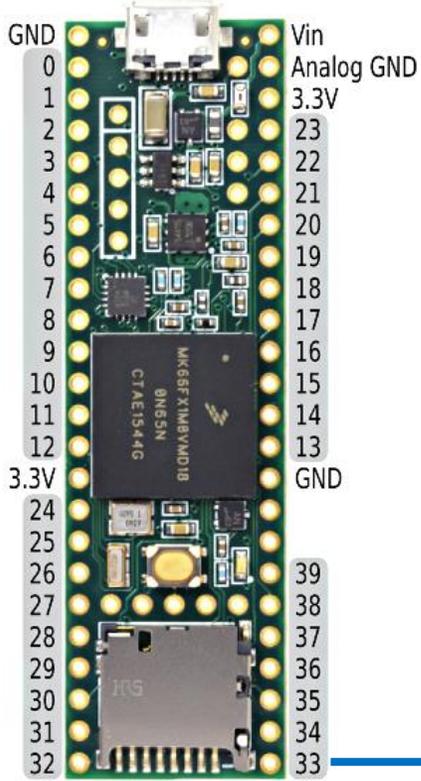
GND ↔ GND

# HM-10 Bluetooth



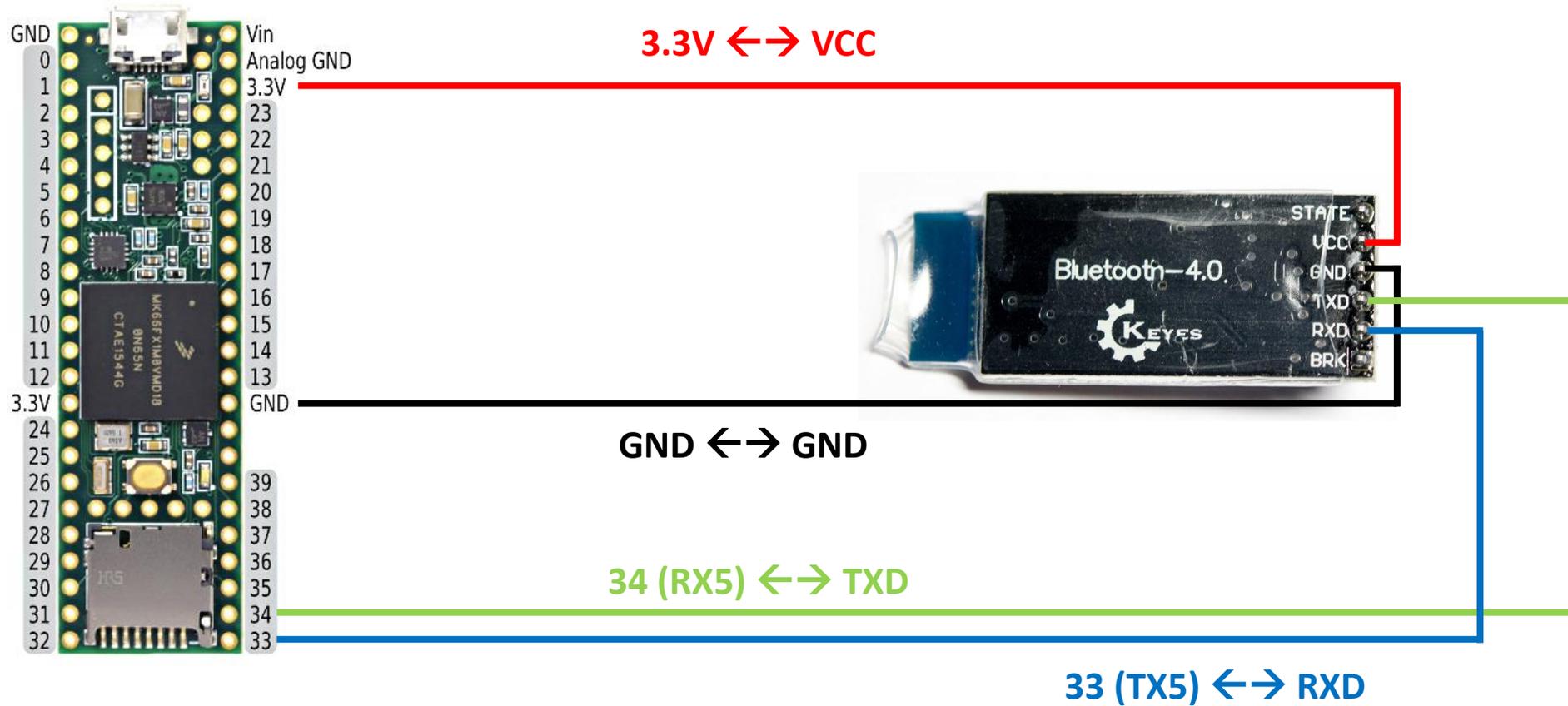
34 (RX5) ←→ TXD

# HM-10 Bluetooth



33 (TX5) ↔ RXD

# HM-10 Bluetooth

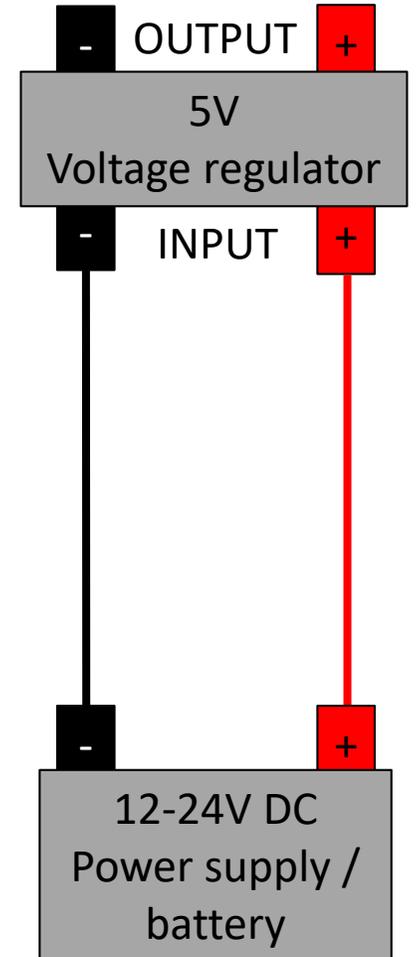
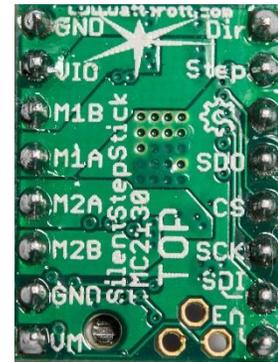
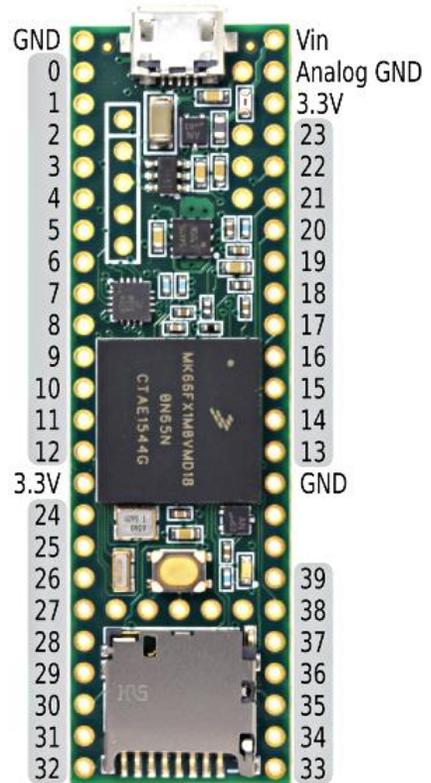




**Step 2:**

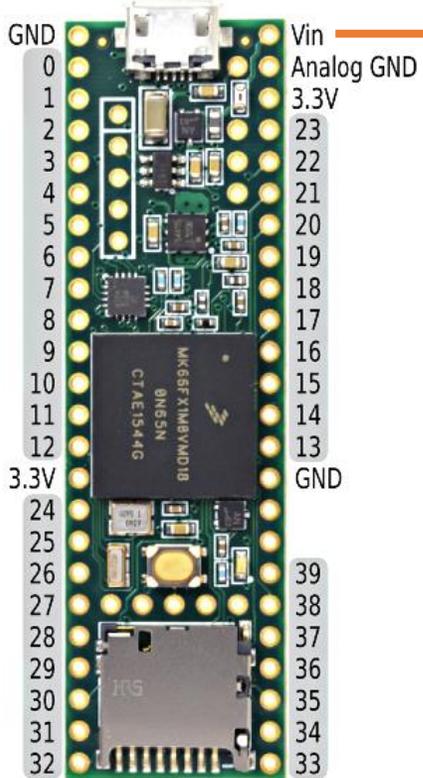
**TMC-2130 stepper driver**

## TMC-2130: X-axis

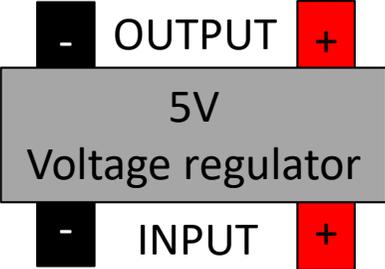




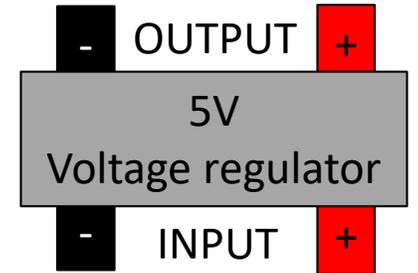
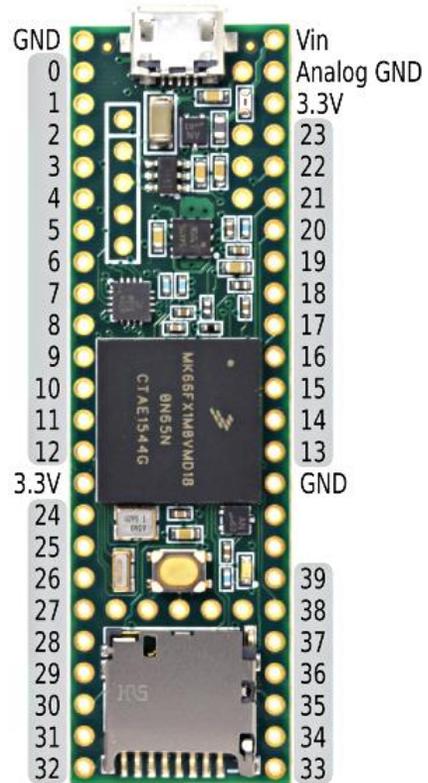
# TMC-2130: X-axis



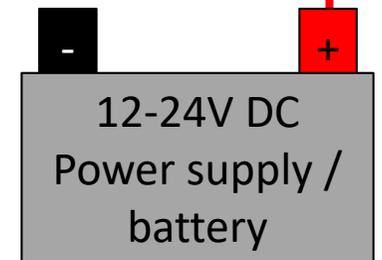
VIN ↔ +5V



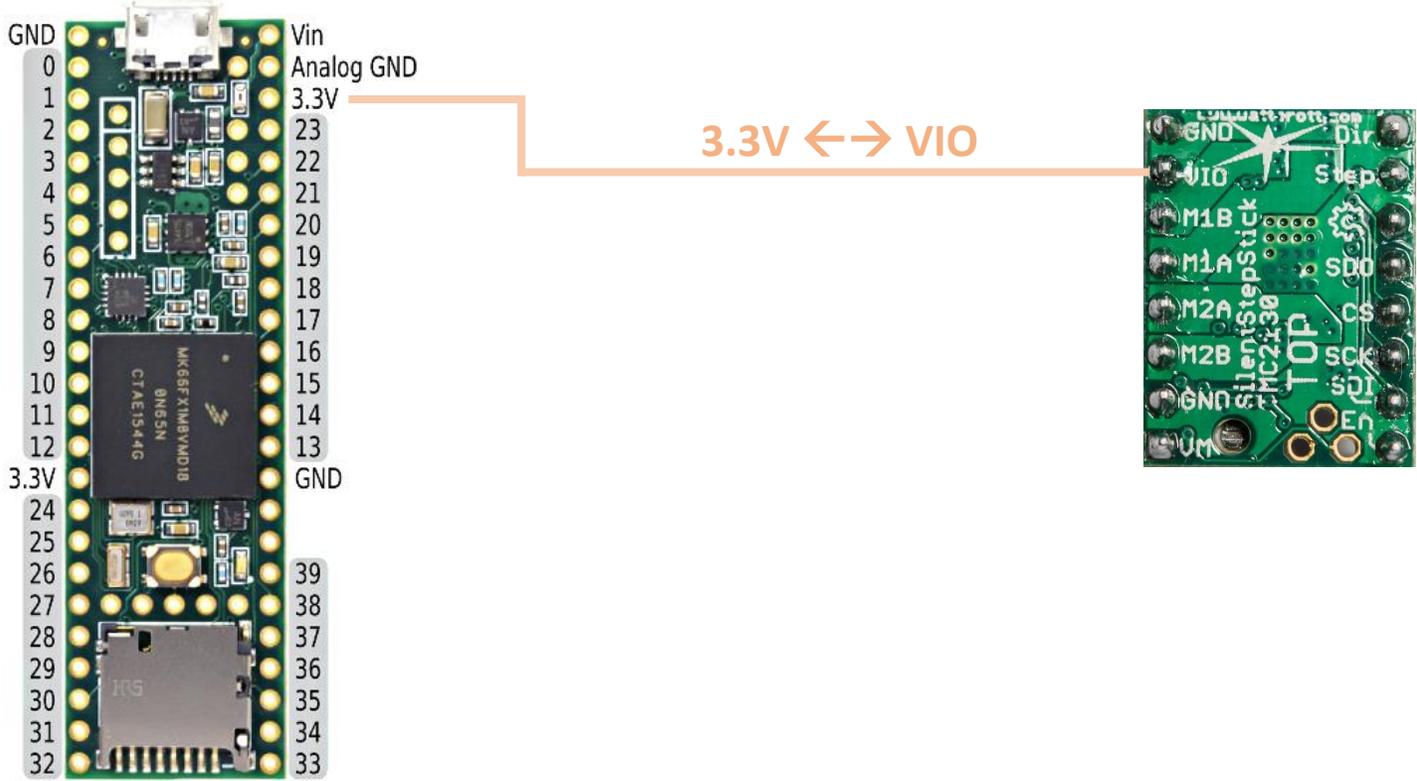
## TMC-2130: X-axis



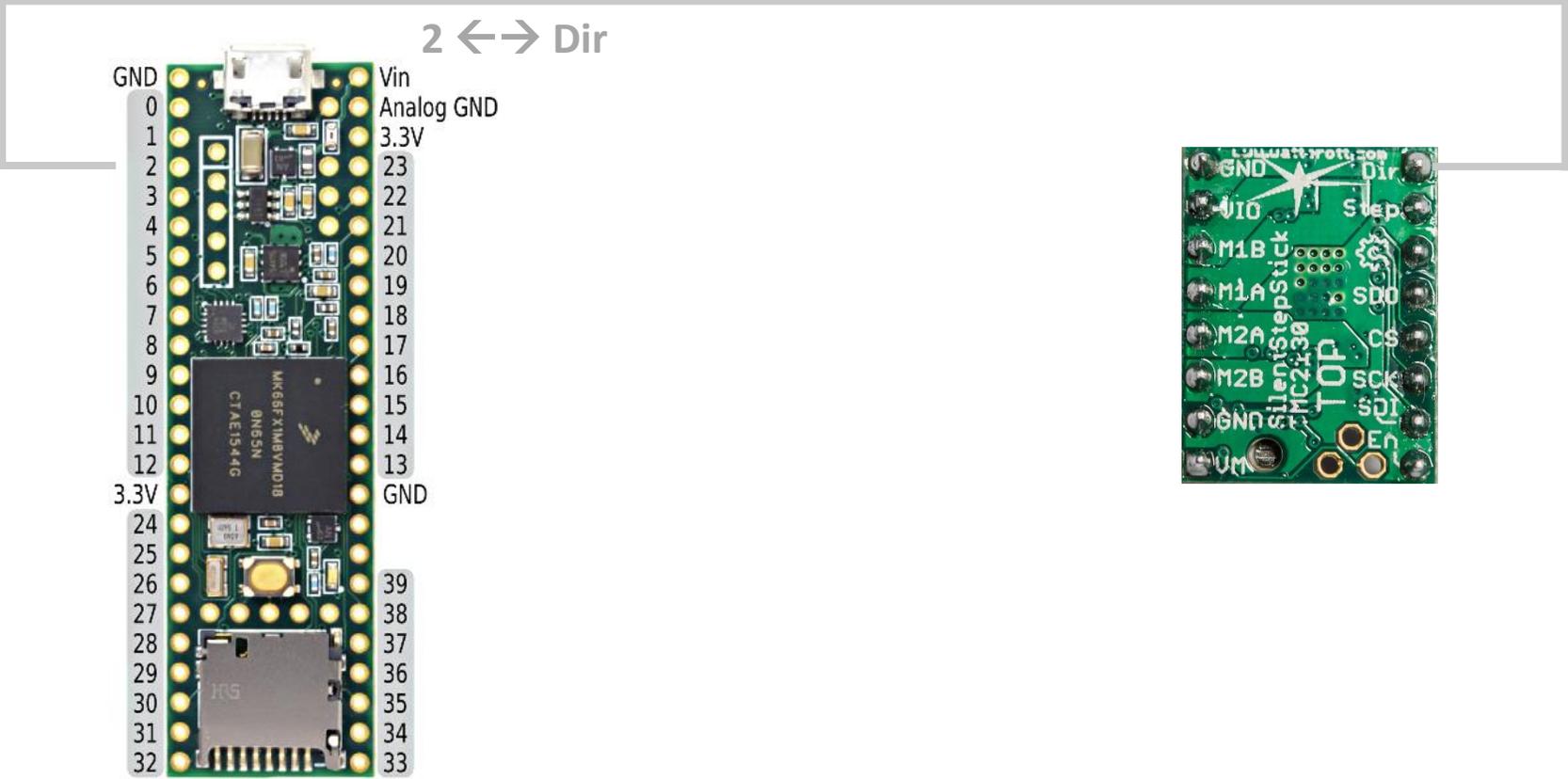
VM ← → 12-24V



# TMC-2130: X-axis

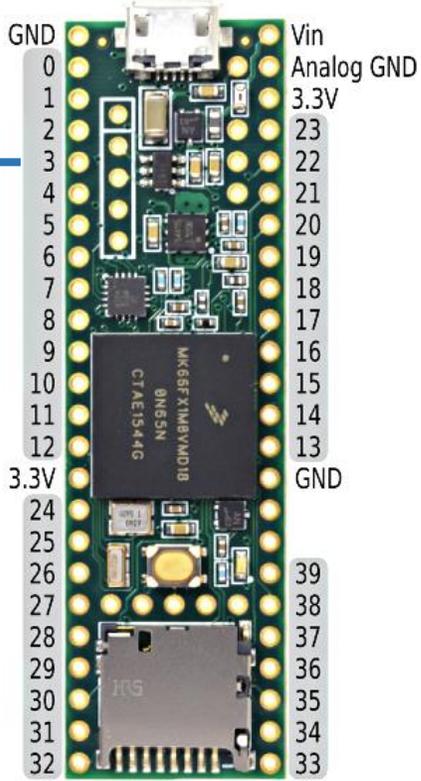
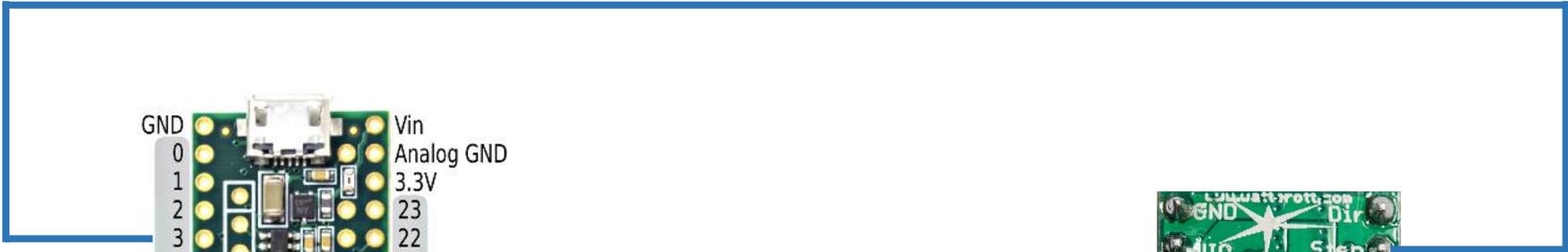


# TMC-2130: X-axis

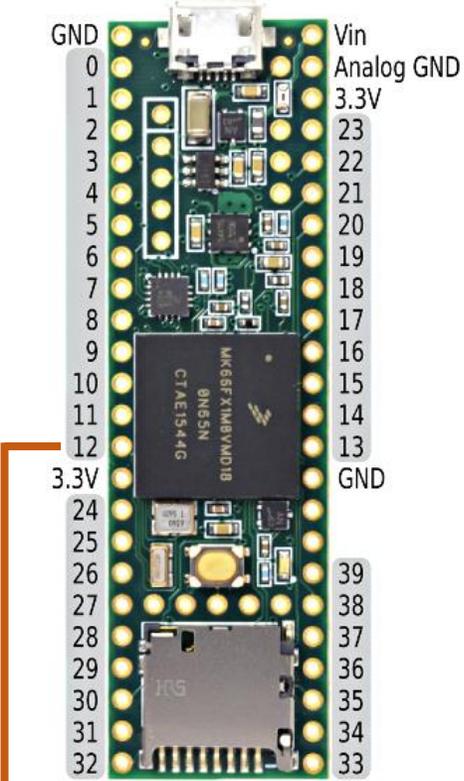


# TMC-2130: X-axis

3 ↔ Step

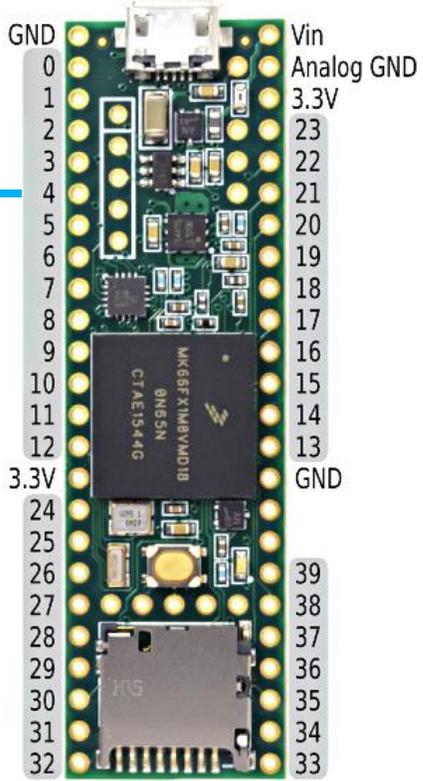


TMC-2130: X-axis



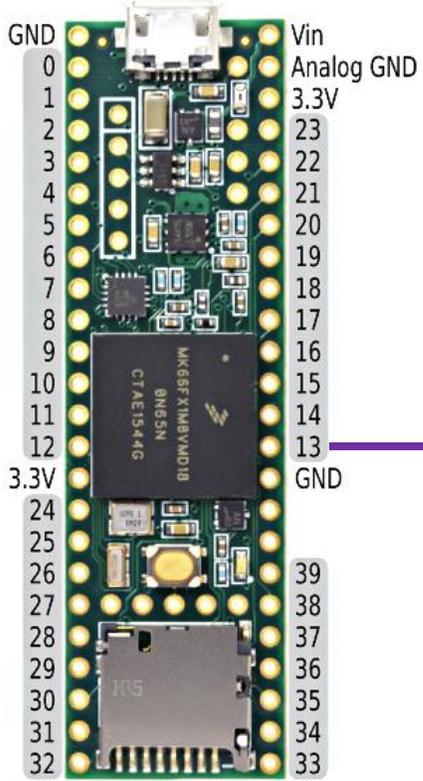
12 (MISO) ↔ SDO

TMC2130: X-axis



4 ↔ CS

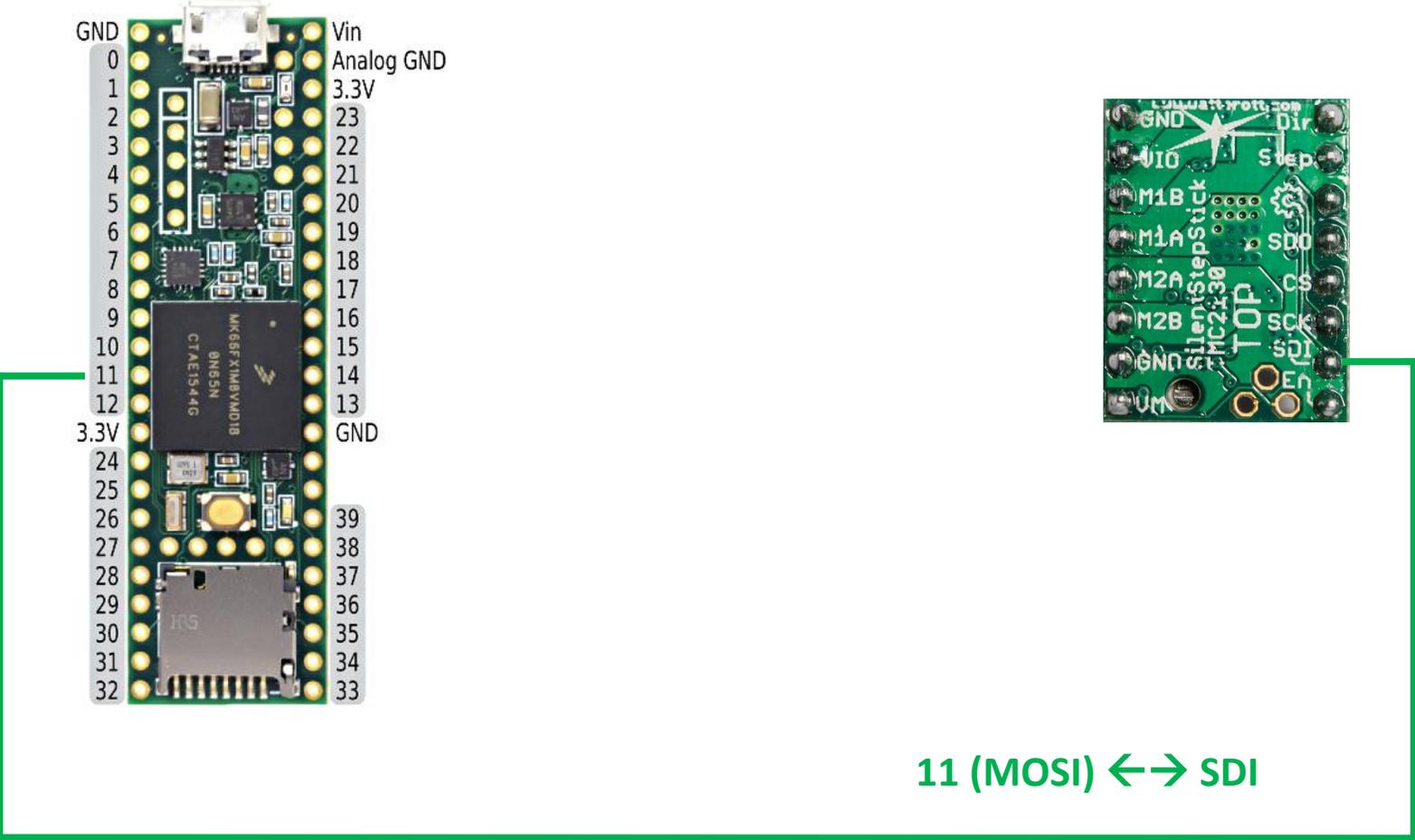
TMC-2130: X-axis



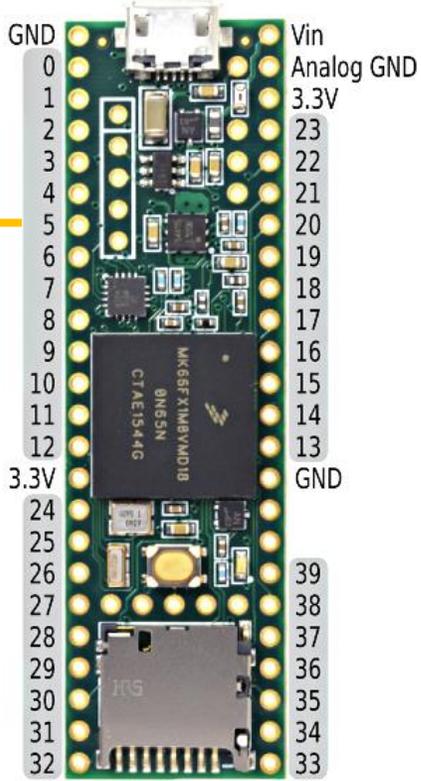
13 (SCK) ↔ SCK



TMC-2130: X-axis

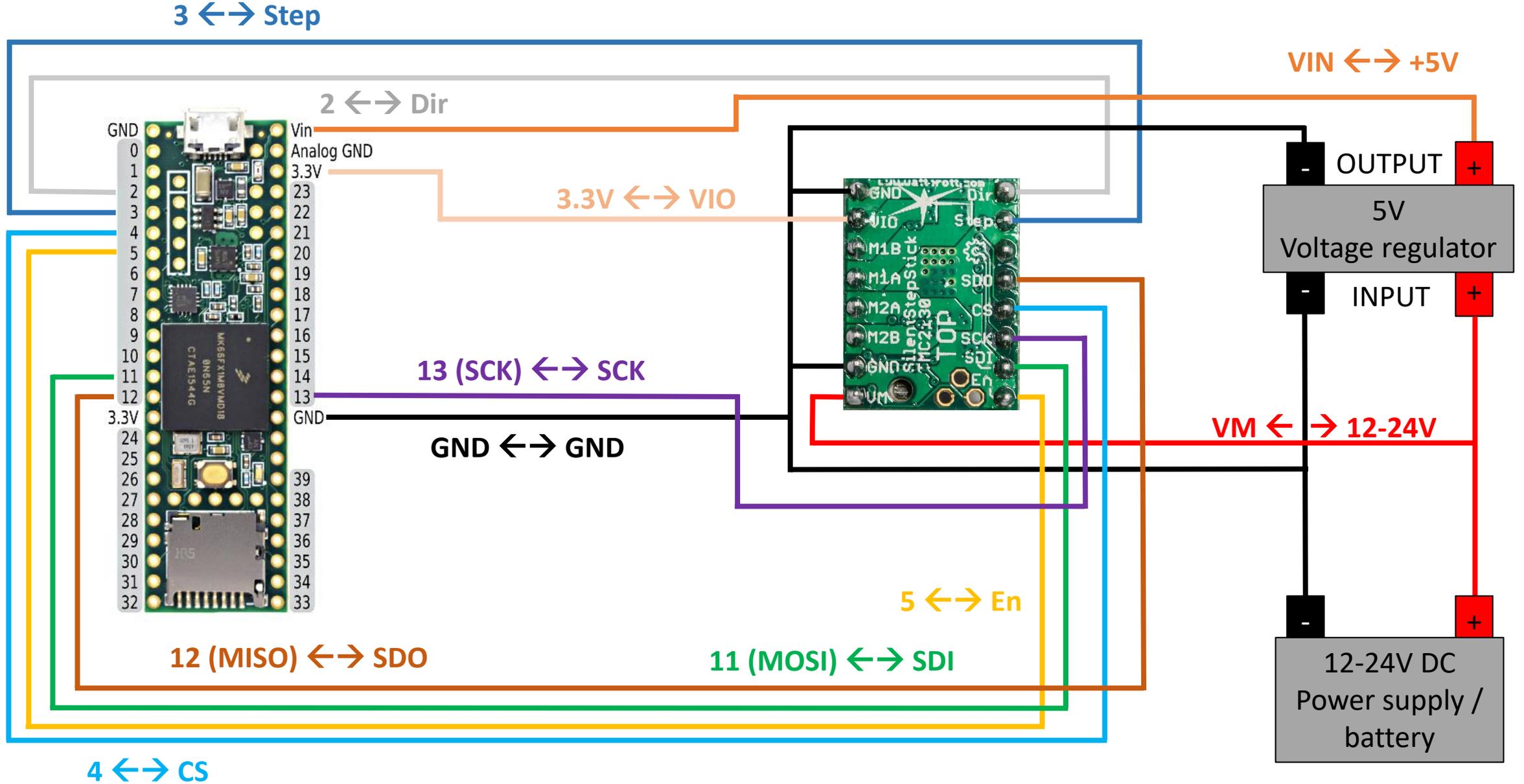


# TMC2130: X-axis

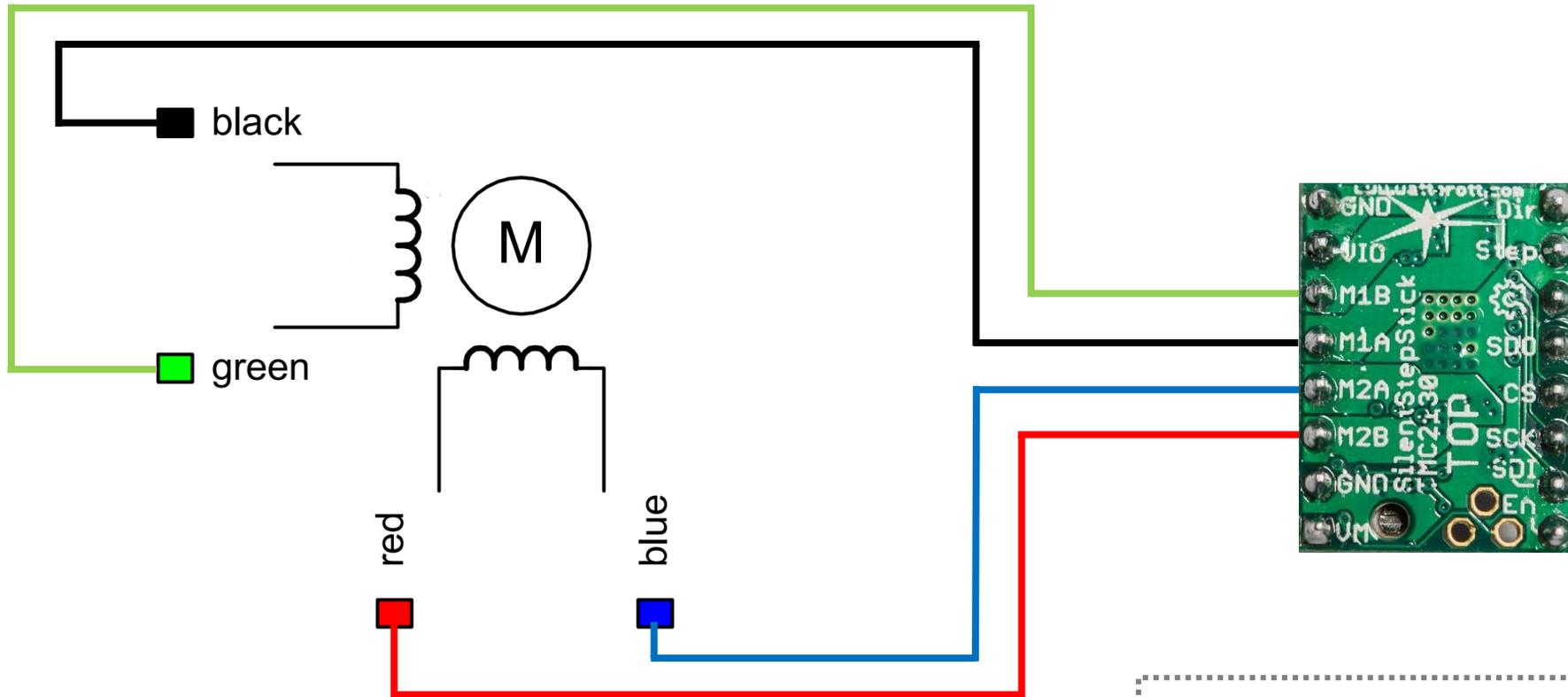


5 ↔ En

# TMC-2130: X-axis



## TMC-2130: X-axis



NOTE:

Color of stepper motor cables might be different. Please check stepper manual for correct connection.

## TMC-2130: Axis layout

	EN	CS	STEP	DIR
U	30	29	28	27
V	36	35	32	31
W	38	37	39	14
X	5	4	3	2
Y	8	9	7	6
Z	25	26	24	10



If you want to add multiply axis, you have to used this pin-layout for the drivers.

All other pins (GND, VIO, VM, SDO, CSK, SDI) can be connected in parallel between all drivers.



**Step 3:**

**Optocoupler for camera focus and trigger signal**

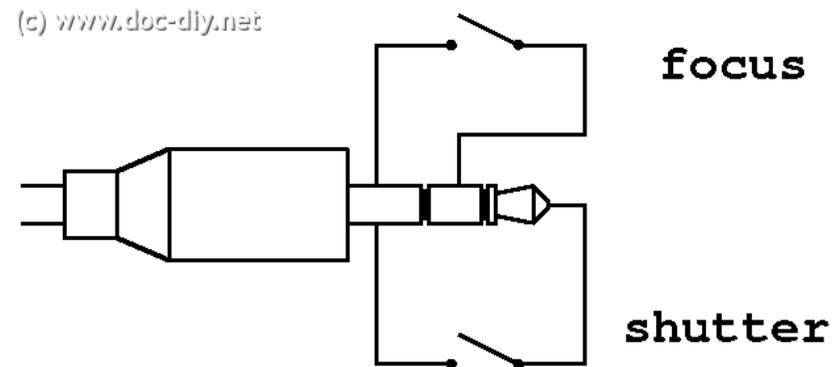
Most larger cameras (DSLRs) will have a port for focus and shutter trigger. There are different types of connectors depending on the camera model. In general, there is always a ground, focus and shutter signal connection.

When the focus signal is connected to ground, the camera will focus. When the shutter signal is connected to ground, the shutter will be released. Some cameras (Sony, Nikon, ...) will required focus and shutter signal at the same time for shutter release.

To switch the focus and shutter signal to ground, optocouplers should be used. This way it is ensured, that the electric circuits of the controller and camera are separated.

For most cameras, there are already suitable trigger cables available. These will have 2.5mm stereo audio connectors and are compatible with most remote triggers. So you should integrate a 2.5mm audio jack into your setup for camera shutter.

In the example on the next page, a audio jack for PCB mount is used, but you can of course use any other audio jack.

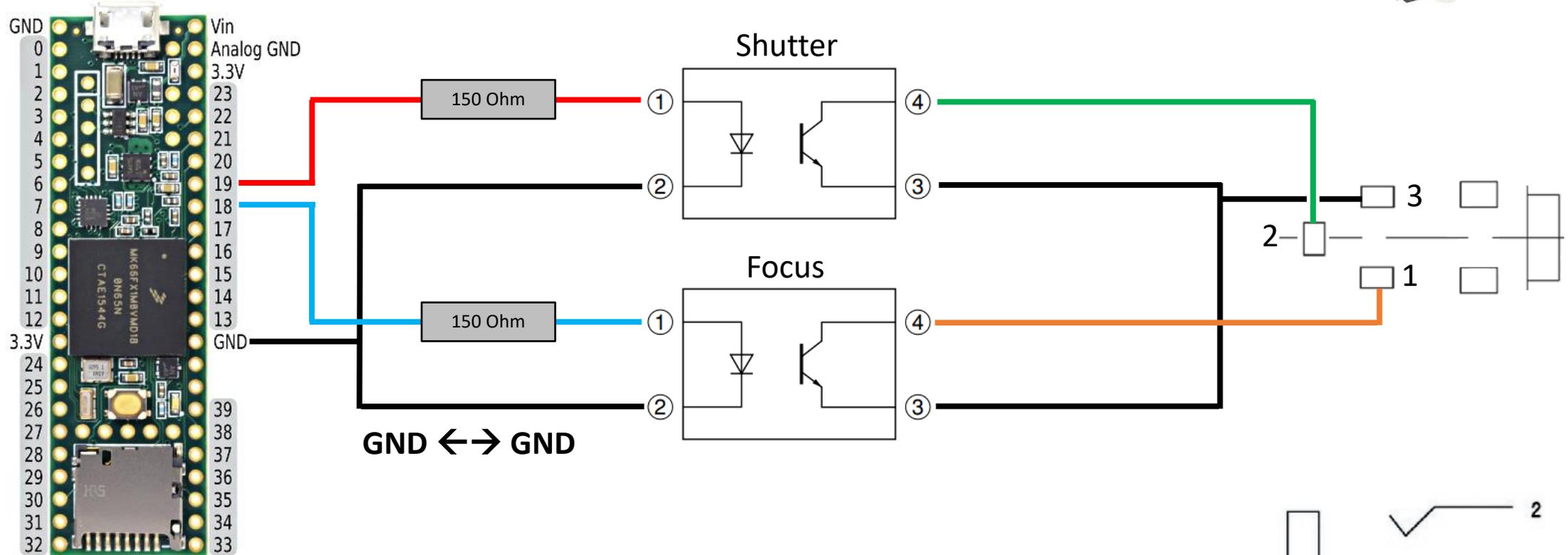


Common pin layout for most cameras can be found here:

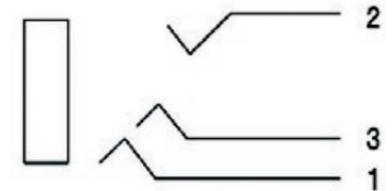
[https://www.doc-diy.net/photo/remote\\_pinout/](https://www.doc-diy.net/photo/remote_pinout/)

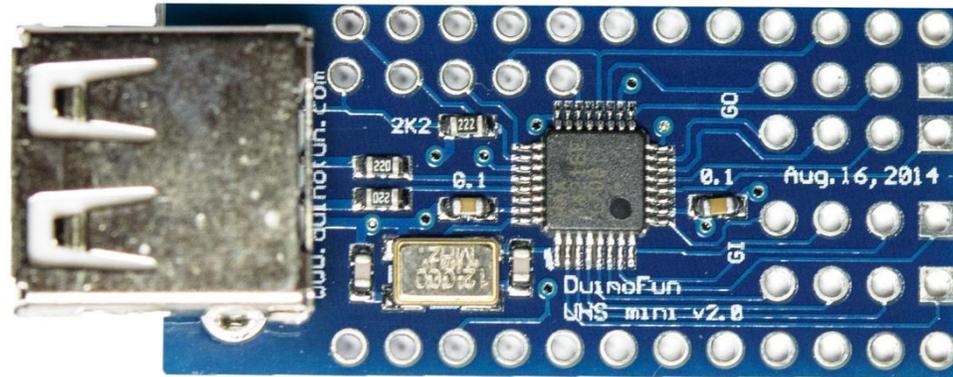
# Optocoupler for camera signal

Lumberg 1501 04



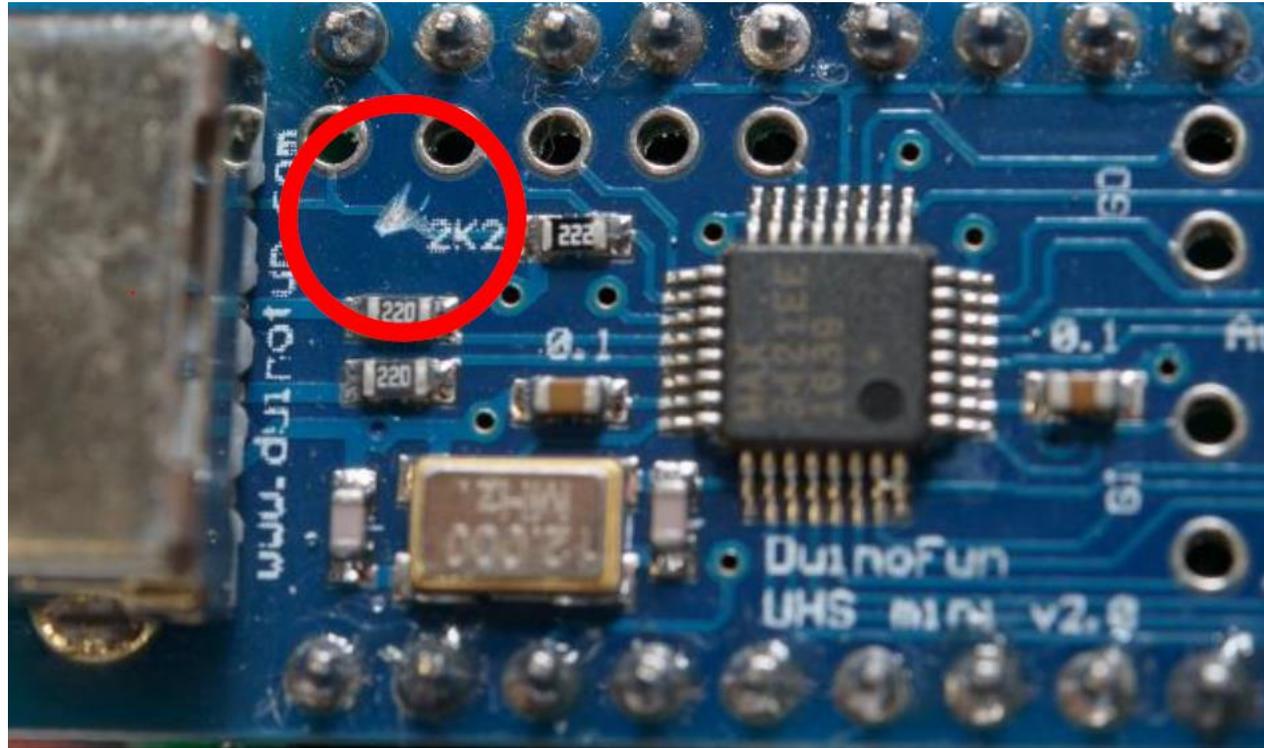
Optocoupler model:  
LTV817, PC123 or similar





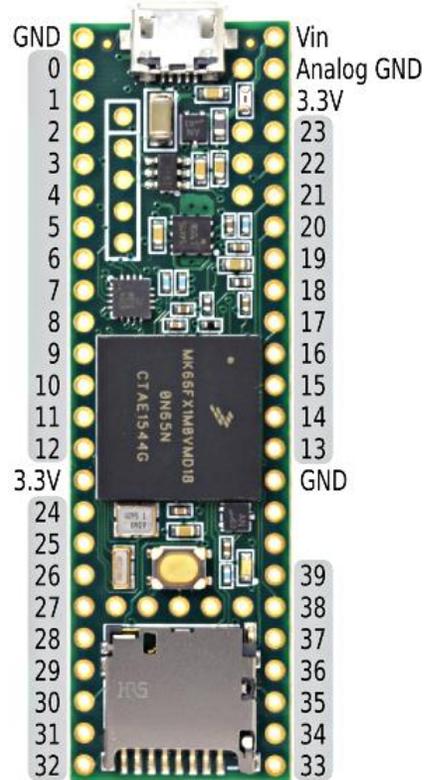
**Step 4 (optional):**

**Mini USB-Host shield  
(for PlayStation 4 controller)**

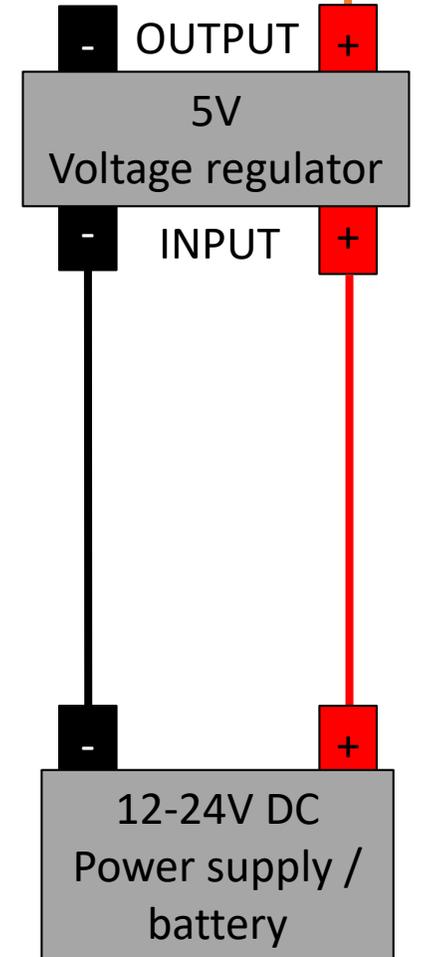


Cut this line on the shield

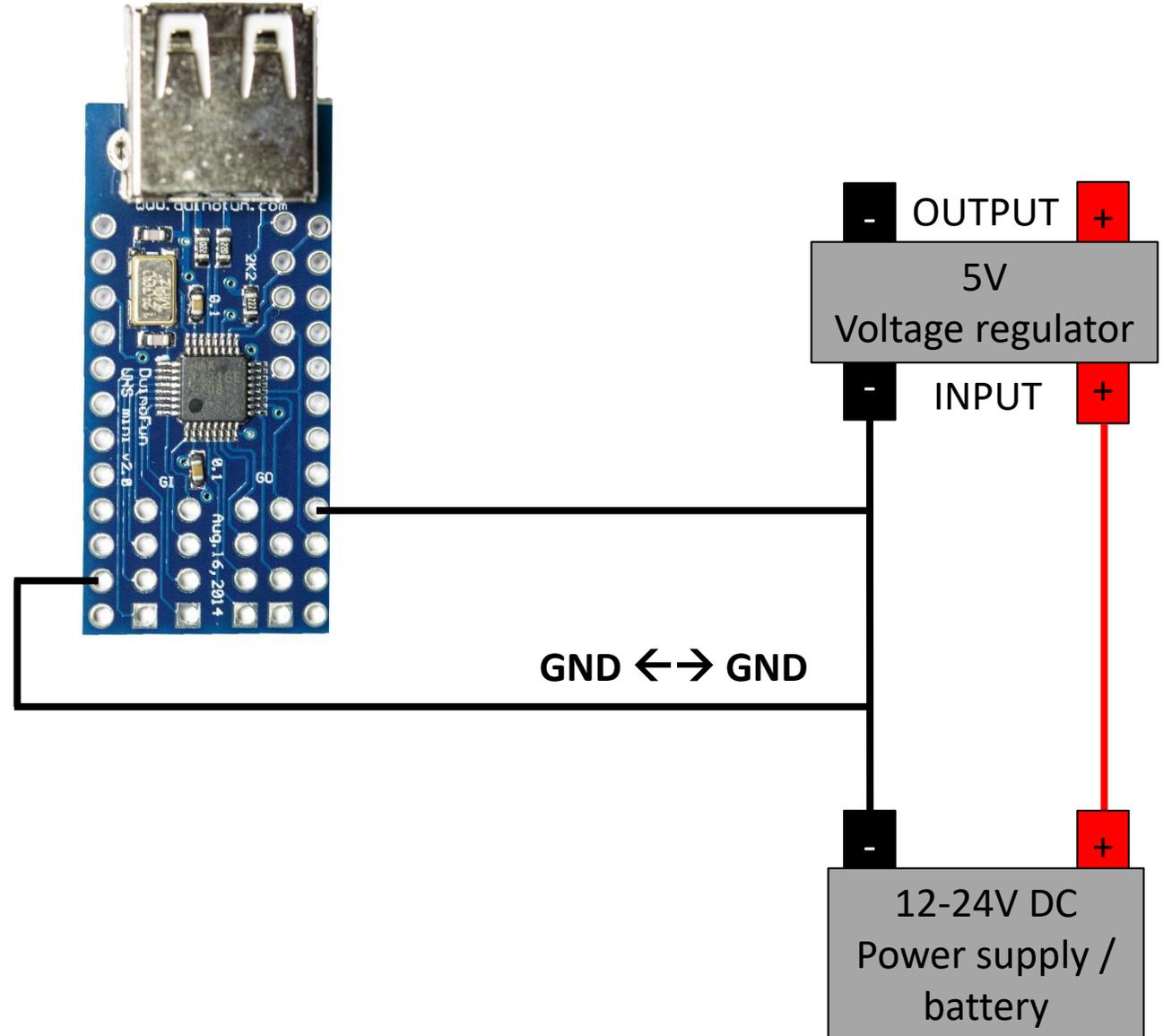
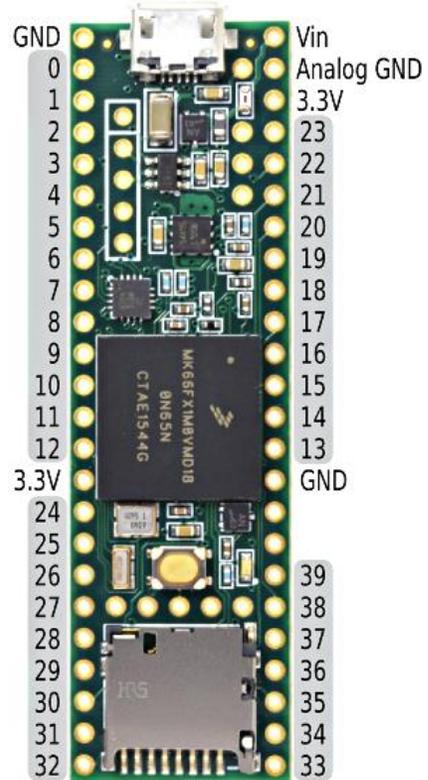
## USB-Host shield



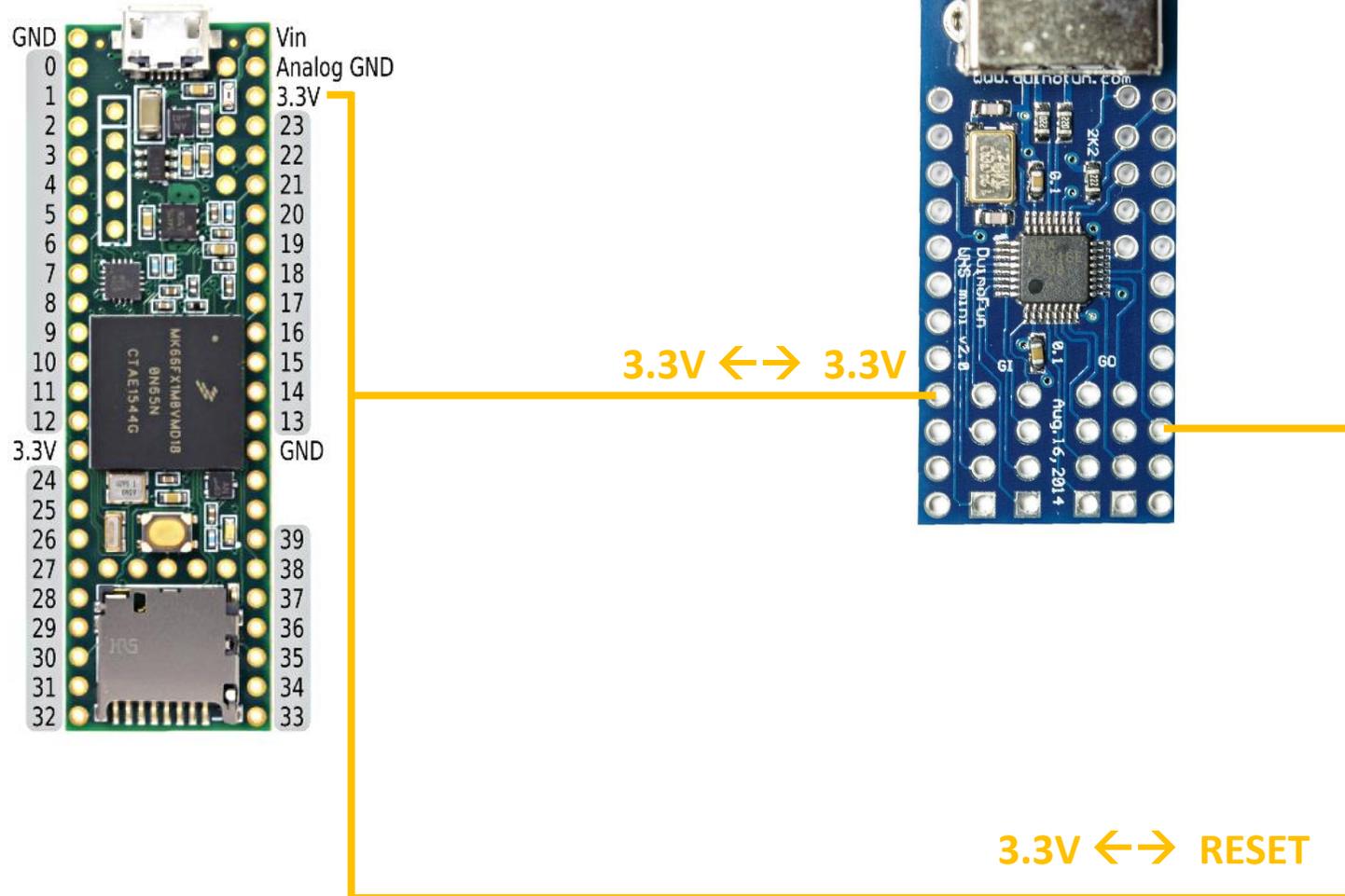
VBUS  $\leftrightarrow$  +5V



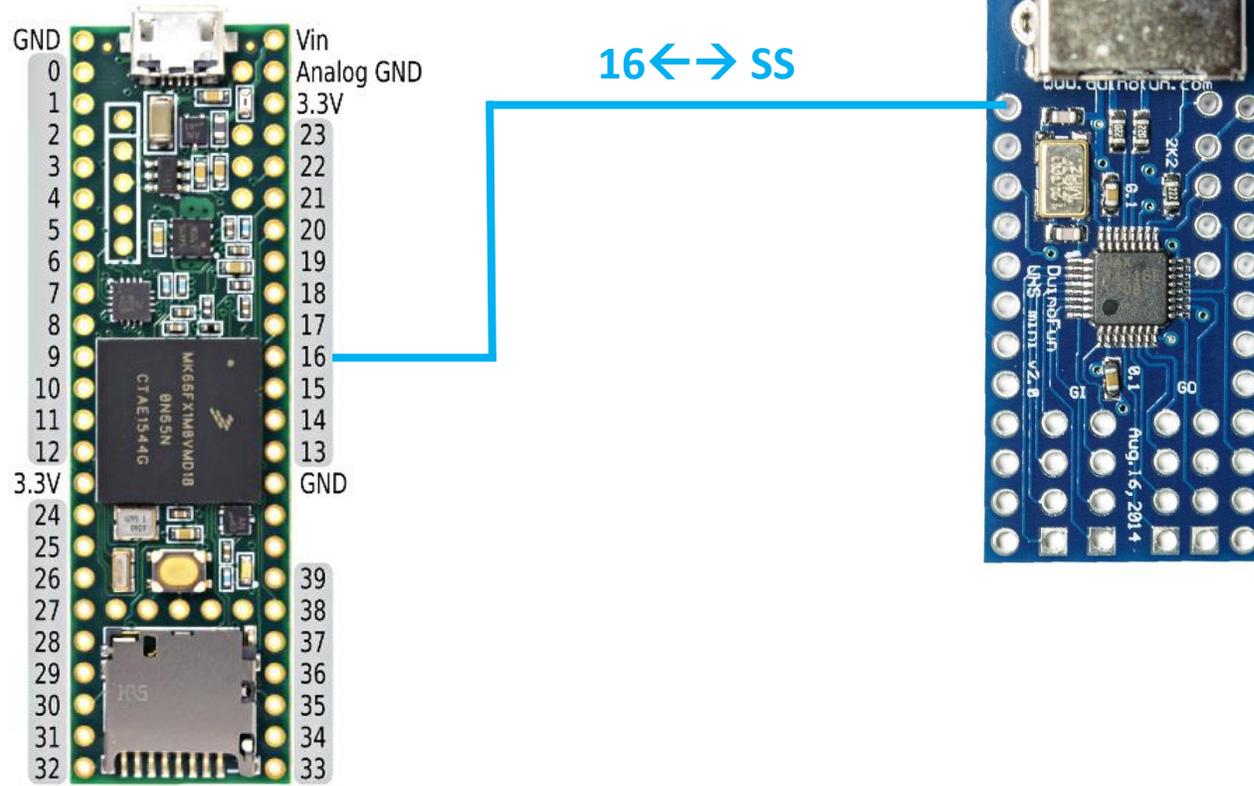
## USB-Host shield



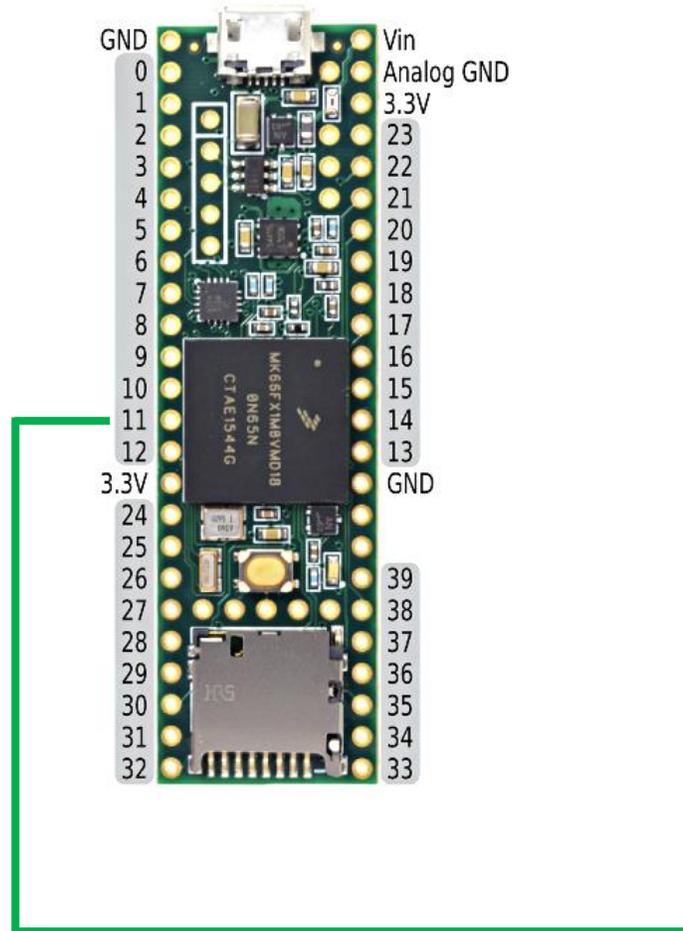
# USB-Host shield



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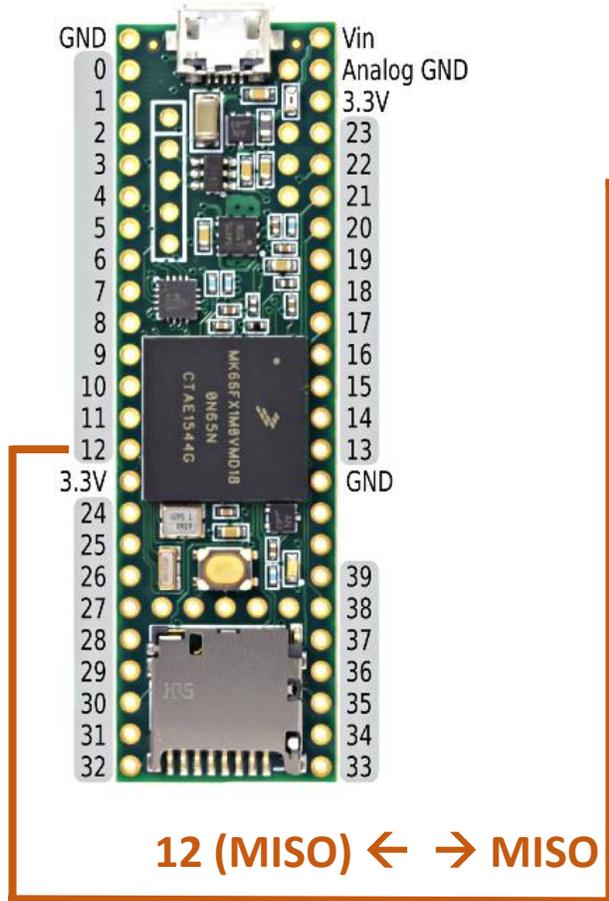


## USB-Host shield

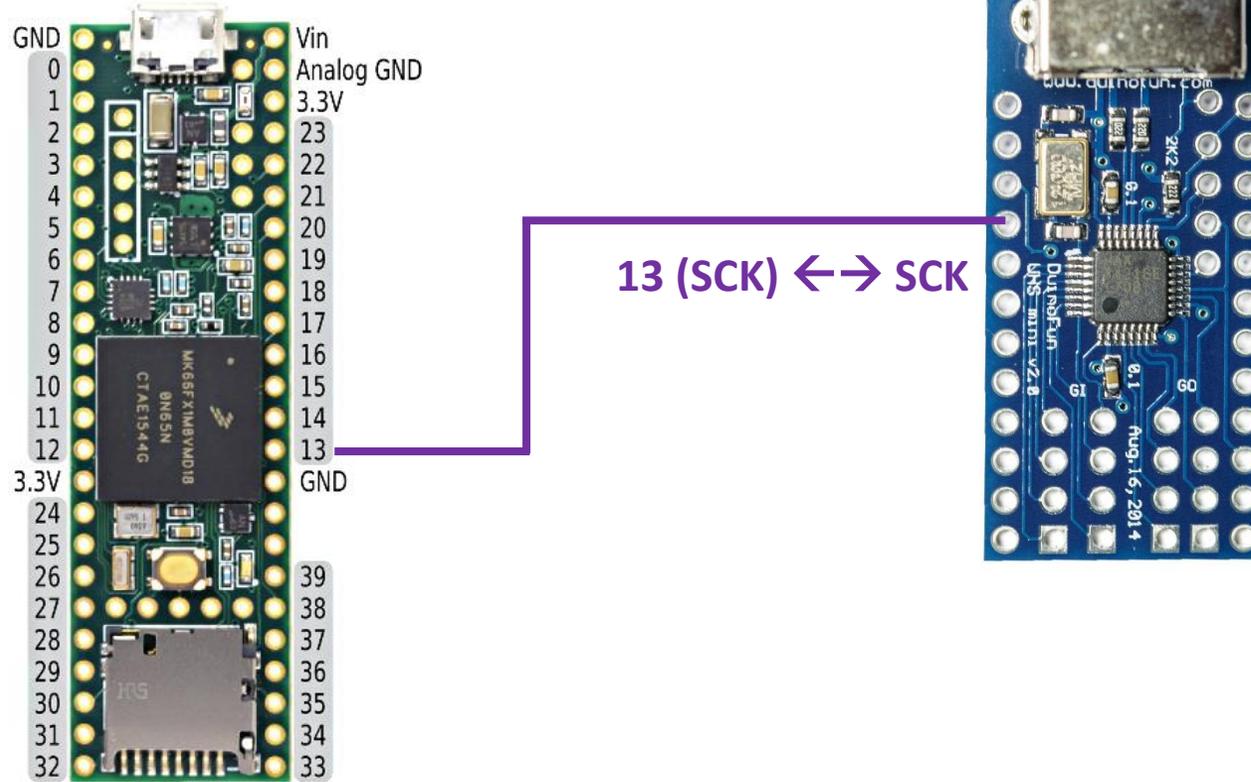


11 (MOSI) ↔ MOSI

## USB-Host shield



## USB-Host shield



# USB-Host shield

