BLDC Shield for Arduino with TLE9879QXA40 Getting Started

March 2019

Agenda

1. BLDC Shield for Arduino
2. Product information and available documentation
3. Arduino IDE Setup
4. Getting started

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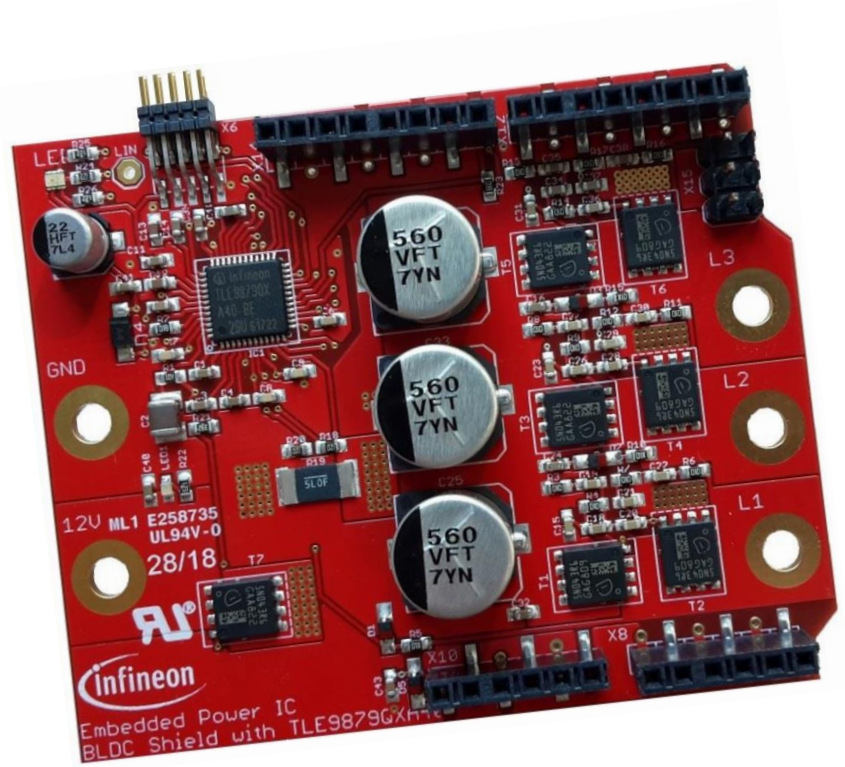
BLDC Shield with TLE9879QXA40 for Arduino

- Voltage supply: typ. 12V
- Infineon® 3-phase MOSFET driver IC (ARM® Cortex® M3 MCU)
- SWD interface for debugging
- LIN Transceiver
- Hall sensor interface
- BLDC_SHIELD_TLE9879: **SP003549500**



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BLDC Shield with TLE9879QXA40 for Arduino

- The BLDC Shield with TLE9879QXA40 for Arduino is part of Infineon Embedded Power system-on-chip solutions and offer an unmatched level of integration of all functions required to control and actuate a brushless DC motor. The four layers PCB is space and cost optimized to demonstrate an application near solution.
- Target Applications: BLDC motor applications in general
- Summary of Features:
  - Automotive qualified 3-phase MOSFET driver IC (TLE9879QXA40)
  - SPI interface with an Arduino baseboard
  - SWD interface for debugging, Hall sensor interface
  - Possibility to stack up to four shields

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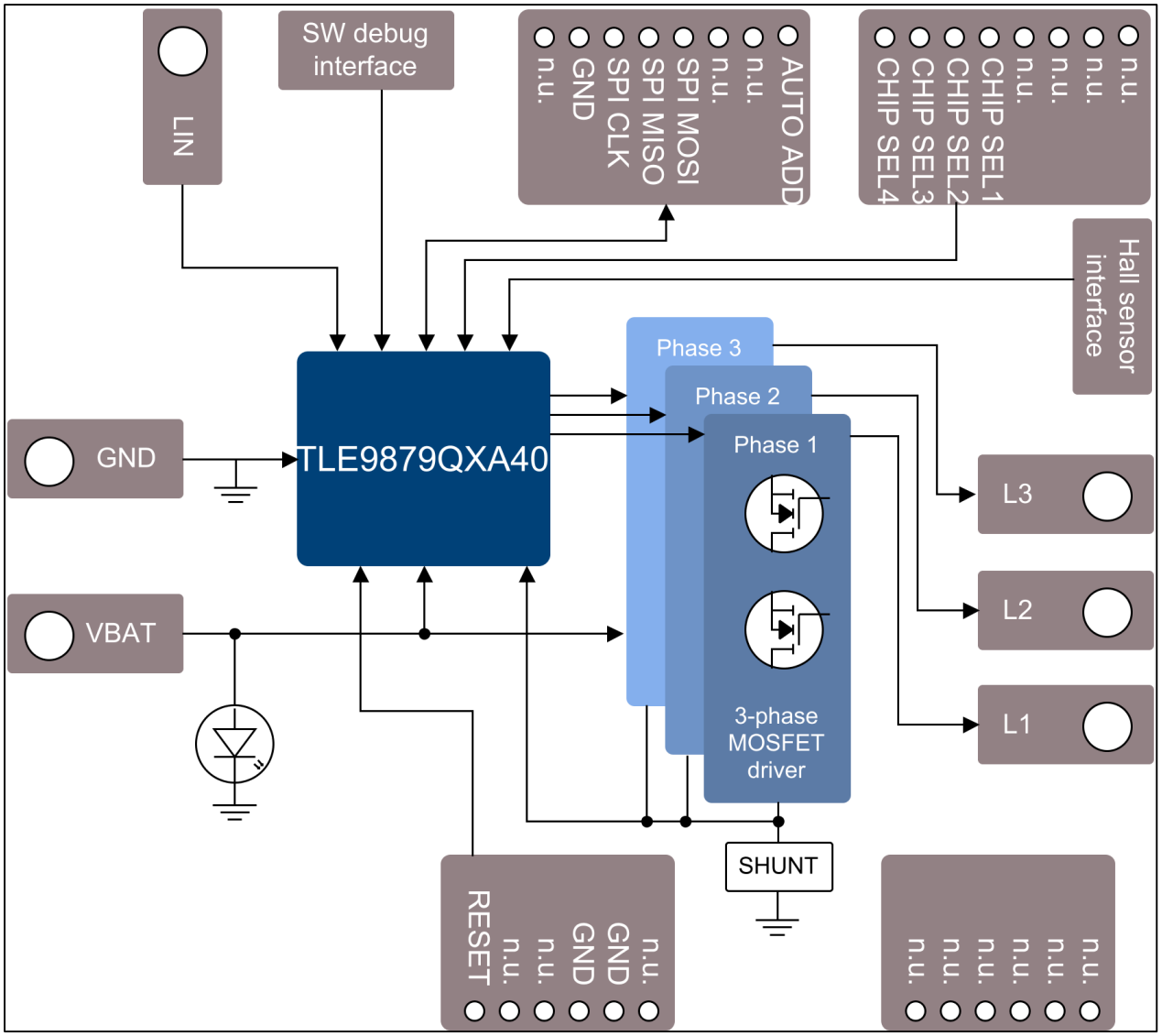
BLDC Shield with TLE9879QXA40 for Arduino



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Support for 3-phase MOSFET Driver IC with Integrated ARM® Cortex® M3

Collaterals and Brochures	› Product Brief › Selection Guides › Product Presentations	› Link to family page
Technical Material	› Datasheets › Application Notes › Getting started › PCB Design Data › User Manuals › Layout Hints	› Link to Documents
Evaluation Boards	› Evaluation Boards › Application Kits	› Link to Boards
Software & Tools	› IFXConfigWizard › Keil µVision5 › Software Examples	› Link to Software & Tools
Videos	› Technical Videos	› Link to Videos

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BLDC Shield with TLE9879QXA40 for Arduino Application kit: Documentation

Content of BLDC Shield info package

```
BLDC Arduino Shield
|
├──00_documentation
|       Product Brief (BLDC_shield_product_brief.pdf)
|       Getting Started (BLDC_getting_started.pptx)
|       User Manual (BLDC_shield_user_manual.pdf)
|
├──01_arduino_library
|       Arduino library (BLDC_Arduino_library.zip)
|       Documentation of Arduino library (docs.html)
|
├──02_example_sketches
|       Blinky Test (bldc_shield_blinky_test)
|       Single Motor Test (bldc_shield_single_motor_test)
|       Multiple Motor Test (bldc_shield_multiple_motor_test)
|
├──03_shield_software
|   |   BLDC Shield flashing (README_shield_software.pptx)
|   |   Toolchain + Software Guide (TLE987x_EvalKit_Getting_Started.pdf)
|   |
|   ├──batch_flashing_shield_software
|   |       Factory Reset Script (TLE9879_Shield_Flash.bat)
|   |
|   └──uVision_project_files
|       |
|       ├──BEMF
|       ├──Bootloader
|       ├──FOC
|       └──HALL
|
├──03_layout
|       Eagle Board Layout (bldc_shield_eagle_layout.zip)
|
└──04_links
```

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Getting started with the Arduino library

The following guide uses the official Arduino Desktop IDE to create and run Arduino projects. This guide is not intended to be a beginner guide for developing for Arduino!

This guide covers the following topics:

1. Install the Arduino Desktop IDE
2. Add the BLDC Shield library to the IDE
3. Code examples with explanations

The guide was written with the Arduino IDE version 1.8.7

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Install the Arduino Desktop IDE

- Go to https://www.arduino.cc/en/Main/Software and download the latest version of the Arduino Desktop IDE for your specific OS
- Install the IDE
- See https://www.arduino.cc/en/Guide/HomePage for help with developing code for Arduino in general

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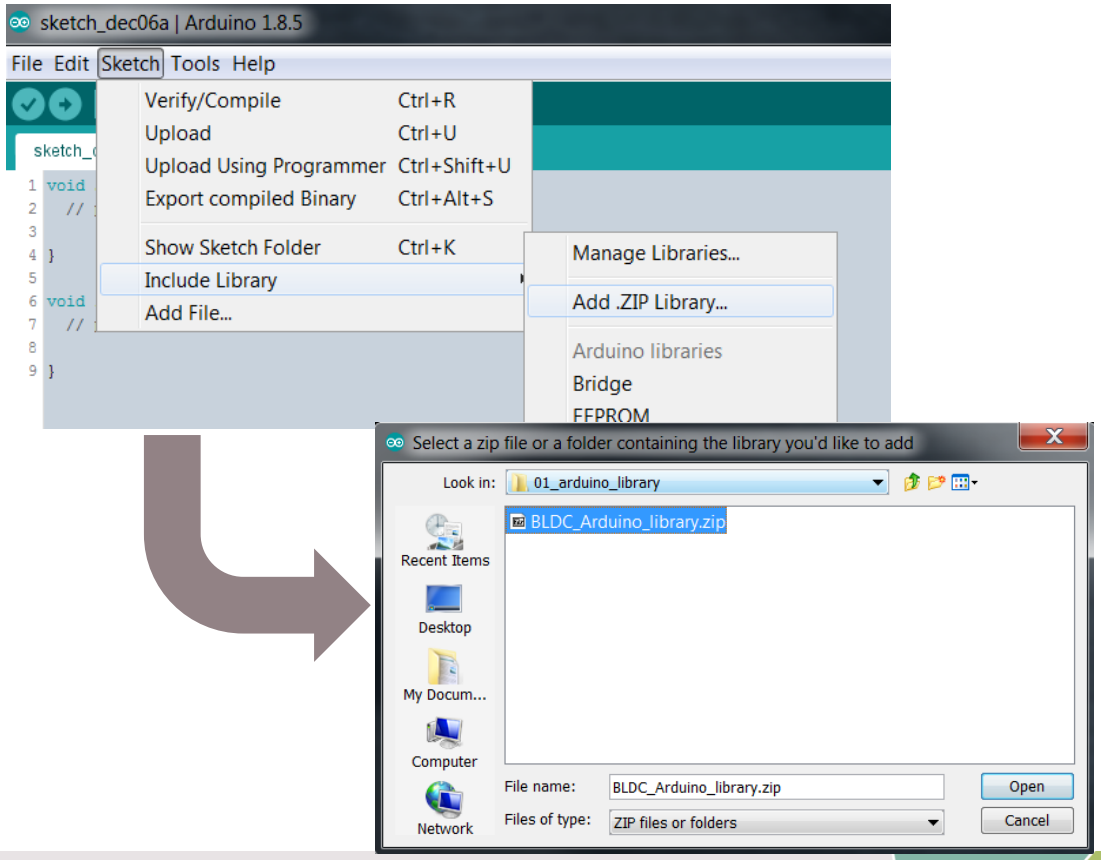
Add the BLDC Shield library to the IDE

- The Arduino website offers an extensive guide on how to add libraries in general (https://www.arduino.cc/en/Guide/Libraries)
- In the following the steps for adding a .zip library are shown:

1. Open the Arduino IDE
2. Go to Sketch -> Include Library -> Add .ZIP Library ...
3. Go to 01_arduino_library and select the archive 'BLDC_Arduino_library.zip'
4. The library is now available in your IDE



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Getting Started with the BLDC Shield

- The following slides show how to run your first code with the BLDC Shield
  1. Connect the hardware to your PC and supply it with power
  2. Write Blinky test project, compile it and upload it to the Arduino
  3. More example code for running motors
     - Driving a single motor with a single Shield
     - Using multiple Shields to drive multiple motors independently

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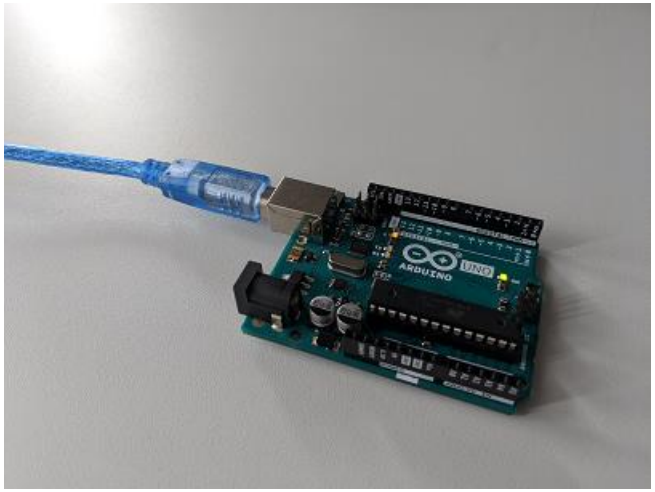
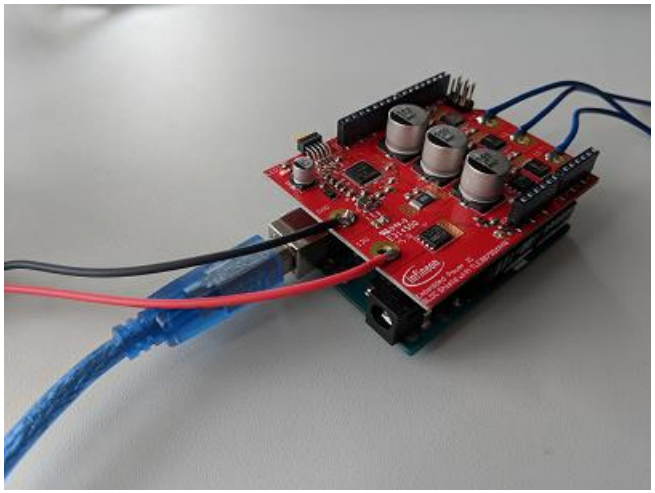
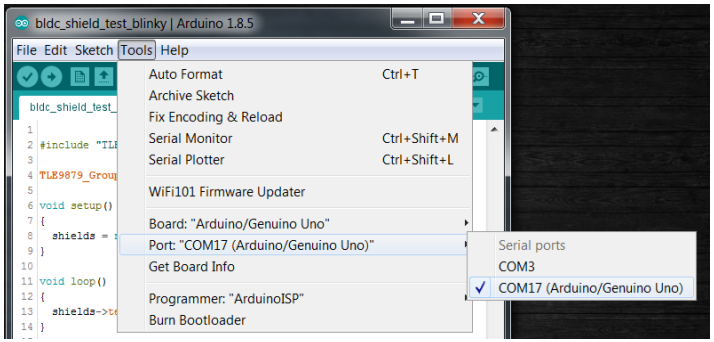
Hardware setup

1. Connect the Arduino via USB to your computer
2. Attach the BLDC Shield via the pin connections
3. Connect the Shield with a 12V power supply
4. In the Arduino IDE go to Tools -> Port and select the USB port the Arduino is connected to







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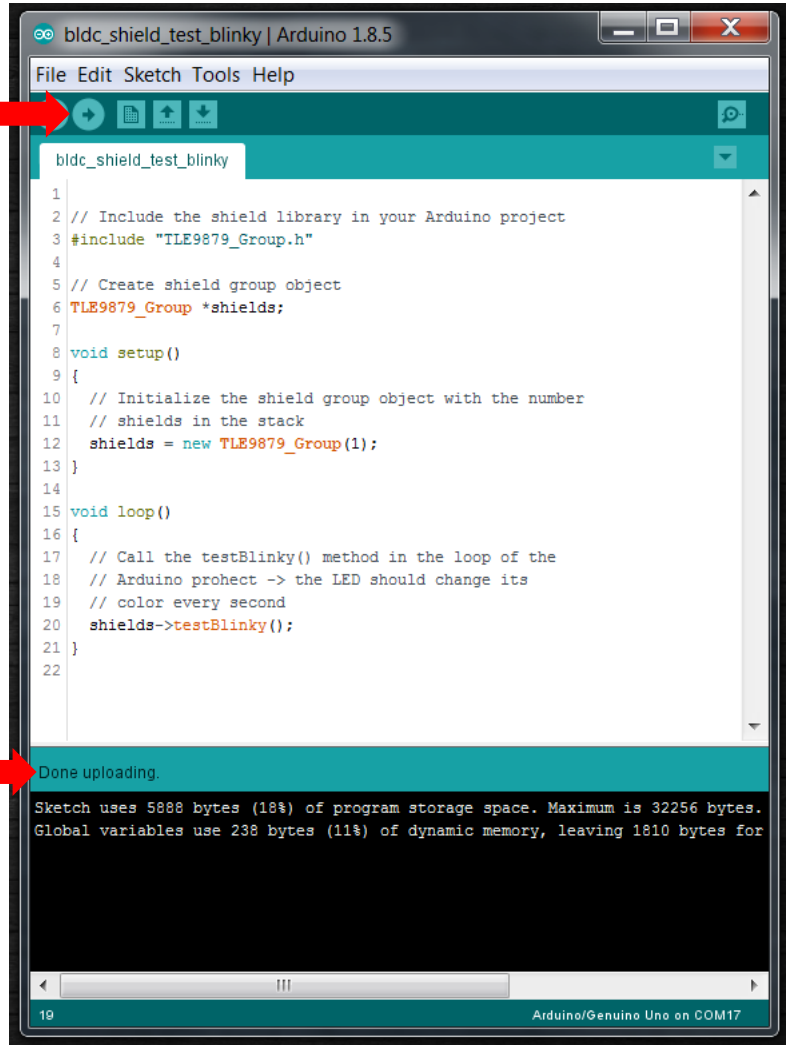
Test Shield with blinky application

1. Copy the example code to the right
2. Press the ‘Upload’ button in the upper left of the Arduino IDE (compiles and uploads the sketch)
3. Wait for the Arduino IDE to finish uploading the sketch
4. The LED of the BLDC Shield should now change its color every second



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Test a single motor with the Shield

- Example code found in /02_example_sketches/bldc_shield_single_motor_test
- Stack consists of one Shield
- Runs the motor once for 5 seconds, then stops it
- If the motor does not run properly, the motor parameters have to be adjusted.

bldc_shield_single_motor_test

```
1
2  // Include the Shield library to your Arduino project
3  #include "TLE9879_Group.h"
4
5  // Declare Shield group object
6  TLE9879_Group *shields;
7
8  void setup()
9  {
10   // Initialize the Shield group object with the
11   // number of Shields in the stack
12   shields = new TLE9879_Group(1);
13
14   // Set the desired mode (FOC, HALL, BEMF)
15   shields->setMode(FOC);
16
17   // Set the desired motor speed (RPM)
18   shields->setMotorSpeed(1000);
19
20   /*
21   You might have to adjust the motor parameters,
22   in case the motor does not run properly.
23   */
24
25   // Start the motor and let it run for 5 seconds,
26   // then stop the motor
27   shields->setMotorMode(START_MOTOR);
28   delay(5000);
29   shields->setMotorMode(STOP_MOTOR);
30 }
31
32 void loop()
33 {
34 }
```


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Test multiple motors with the Shield

- Example code found in /02_example_sketches/bldc_shield_multiple_motor_test
- Stack consists of two Shields
- Motors run with different RPM and different motor algorithms (FOC and Hall)
- Make sure the Hall connectors of the motor are connected properly to the Shield
- If the motor does not run properly, the motor parameters have to be adjusted.

bldc_shield_multiple_motor_test

```
1
2  // Include the Shield library to your Arduino project
3  #include "TLE9879_Group.h"
4
5  // Declare Shield group object
6  TLE9879_Group *shields;
7
8  void setup()
9  {
10   shields = new TLE9879_Group(2);
11
12   // Most of the methods in the TLE9879_Group class
13   // have an optional 'boardnr' parameter, to specify
14   // a single Shield to send the command to.
15   shields->setMode(HALL, BOARD1);
16   shields->setMode(FOC, BOARD1);
17
18   shields->setMotorSpeed(500, BOARD1);
19   shields->setMotorSpeed(2000, BOARD2);
20
21   /*
22   You might have to adjust the motor parameters,
23   in case the motor does not run properly.
24   */
25 }
26
27 void loop()
28 {
29   shields->setMotorMode(START_MOTOR, BOARD1);
30   delay(5000);
31   shields->setMotorMode(START_MOTOR, BOARD2);
32   delay(5000);
33   shields->setMotorMode(STOP_MOTOR, BOARD1);
34   delay(5000);
35   shields->setMotorMode(STOP_MOTOR, BOARD2);
36   delay(5000);
37 }
```


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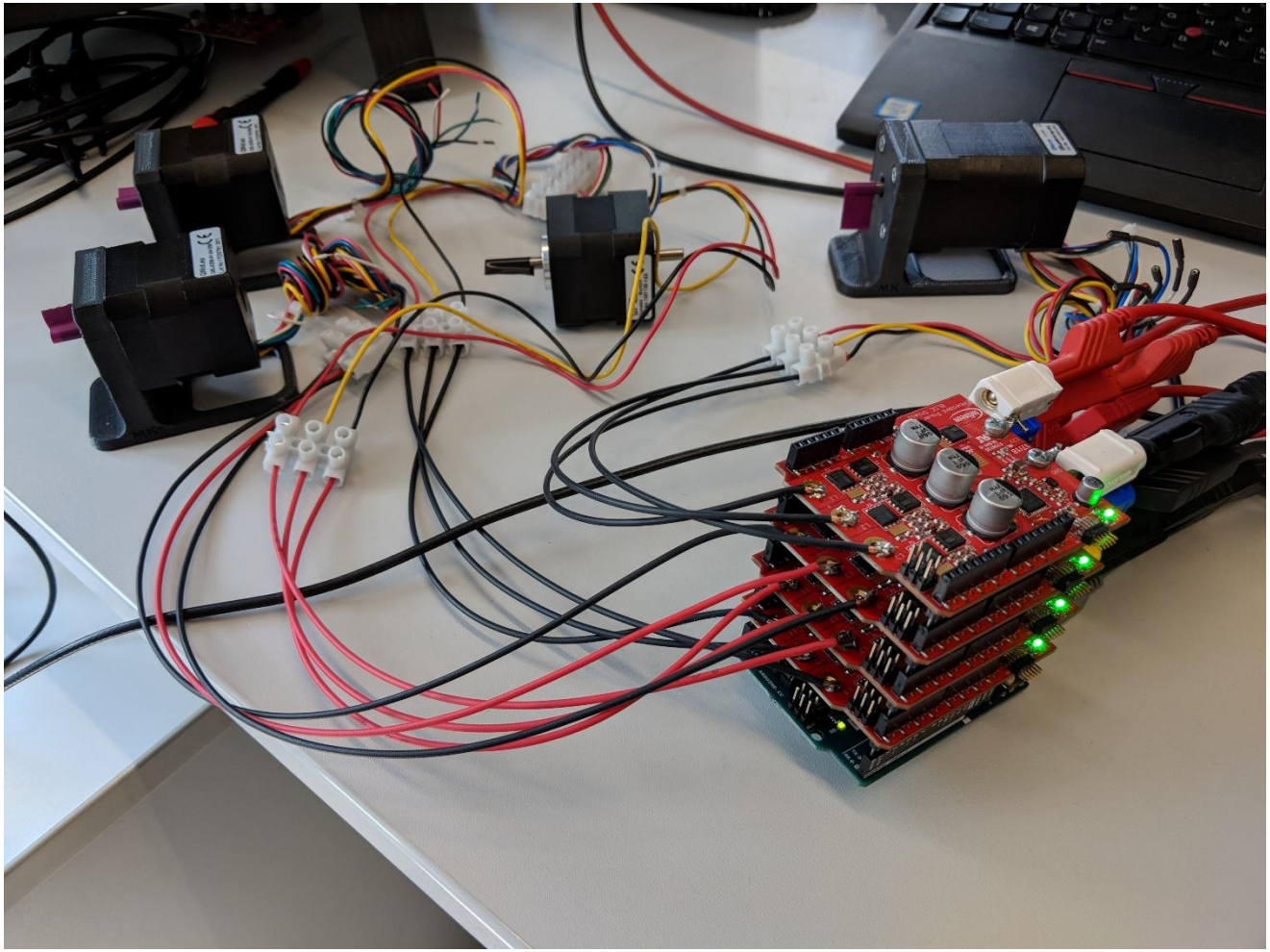
Test multiple motors with a stack of Shields



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