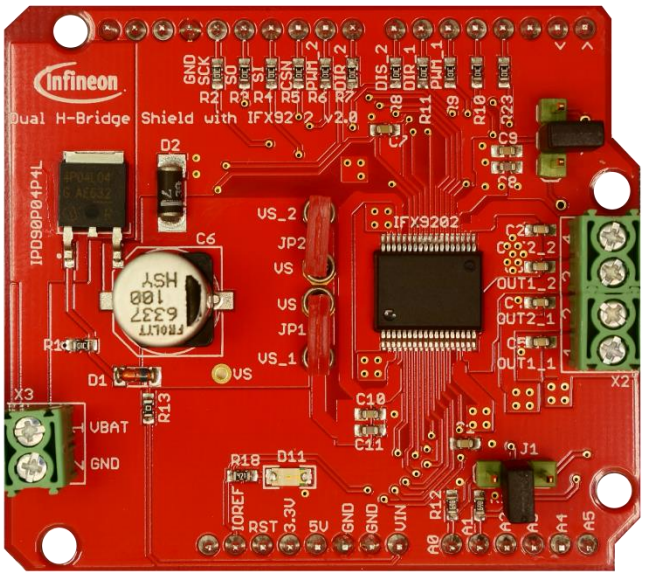
Dual H-Bridge shield

Shield for DC motor control with IFX9202



About this document

Scope and purpose

This document details the functionality and the required steps for running the Dual H-Bridge shield. Included are instructions for installing the necessary software as well as connecting the device.

Infineon's Dual H-Bridge shield is designed to integrate with a microcontroller board, such as the XMC1100 Boot Kit, the XMC4700 Relax Kit 5V or any other microcontroller board using the ARDUINO™ UNO connector interface. Coupled together, this shield-microcontroller implementation provides a low-cost solution for driving two small brushed DC motors. The key component, the IFX9201, is an integrated Dual H-Bridge capable of driving up to 6 A (peak) per channel.

Intended audience

This board user manual is intended for anyone interested in evaluating DC motor control with the IFX9202 or looking for a simple solution to drive two brushed DC motors, e.g. in home automation or robotics.

Sales product name IFX9202ED_DEV_BOARD
Order code IFX9202EDDEVBOARDTOBO1

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1 Overview

The Dual H-Bridge shield with IFX9202 is a shield for microcontroller boards compliant with the ARDUINO™ pin header. A simplified block diagram is shown in Figure 1.

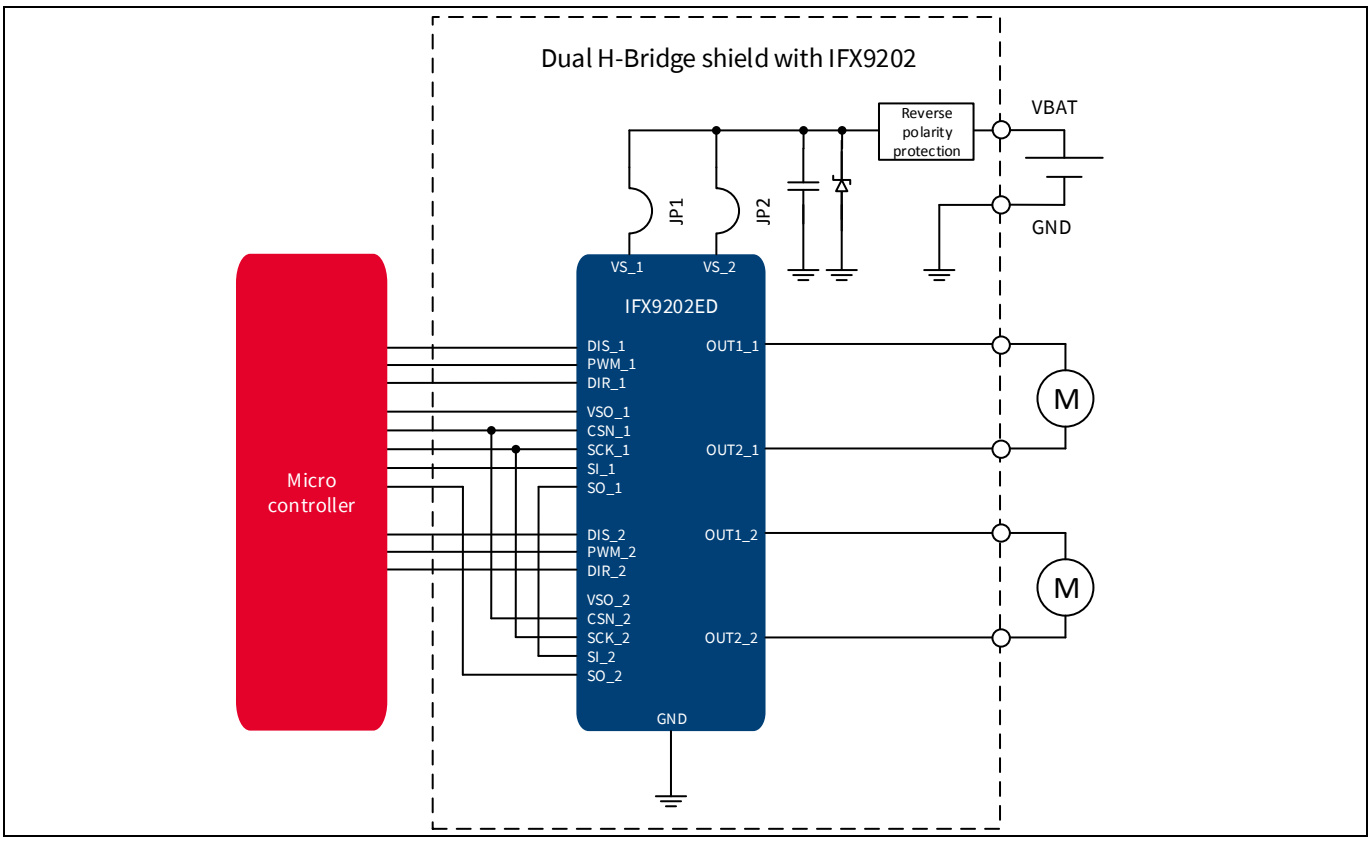

Figure 1 Simplified block diagram Dual H-Bridge shield with IFX9202

For more information on the IFX9202, please visit www.infineon.com/powertrain-h-bridges.

2 Getting started

Main connections are shown in Figure 2.

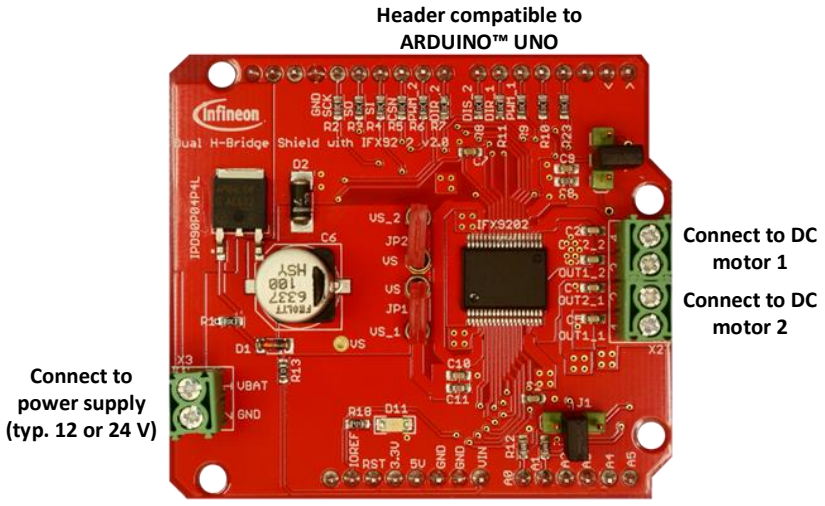

Figure 2 Top view Dual H-Bridge shield with IFX9202

2.1 Selecting a DC motor

The IFX9202 can drive small DC motors with peak currents up to 6 A. The achievable continuous drive current is lower and depends on supply voltage, switching frequency and cooling conditions. Realistic continuous drive currents for this kit are in the range of 1 A per channel or 2 A in total, more can be achieved by use of a cooling element. Many DC motors which are utilized for applications such as home automation, moving robots and mechanical toys typically fall in this range of drive current. You can connect up to two suitable DC motors or similar loads.

2.2 Connecting the shield to a microcontroller board

To get started with the kit, connect it to a microcontroller board (in this manual, the XMC1100 Boot kit is used).

2.3 Software

For the XMC1100 Boot Kit, there is a ready-to-use demo script which can be downloaded from https://www.infineon.com/cms/en/product/evaluation-boards/ifx9202ed_dev_board; see chapter 3 for more details. This program was generated using the Infineon code development platform DAVE™ (Version 4). Additional information as well as instructions for using DAVE™ and a download link can be found here: http://www.infineon.com/dave.

2.1 Power supply

For providing the power to drive a DC motor, the Dual H-Bridge shield with IFX9202 needs an external power supply connected to VBAT vs. GND. To protect the board from accidentialy reverted supply voltages the Dual H-Bridge shield with IFX9202 is equipped with a reverse polarity protection circuit.

VBAT can range from about 6 V to a maximum of 36 V.

3 Demo operation with XMC1100 Boot Kit

Provided with the XMC1100 Boot Kit is an operational software demo, which is available for download here: https://www.infineon.com/cms/en/product/evaluation-boards/ifx9202ed_dev_board. This code can be used to control the Dual H-Bridge shield with IFX9202 with an XMC1100 Boot Kit by USB using the Terminal interface of a PC.

This chapter describes the firmware update process using DAVE™, the setup of the terminal program and the available commands.

3.1 Device discovery

Make sure the J-Link driver is installed properly. It is included in the installation of DAVE™ (see http://www.infineon.com/dave) and is required for a USB connection as well as a debug interface to the XMC1100 Boot Kit. For more details on J-Link please visit www.segger.com.

Then connect the XMC1100 Boot Kit (with the Dual H-Bridge shield with IFX9202 on top) to the USB port of your PC. The driver for the XMC1100 Boot Kit will now be installed (this may require administrator priviledges). Check in the “Device Manager” of Windows that the “JLink CDC UART Port” has been installed correctly; it should look like Figure 3 (the number of the COM port may be different).

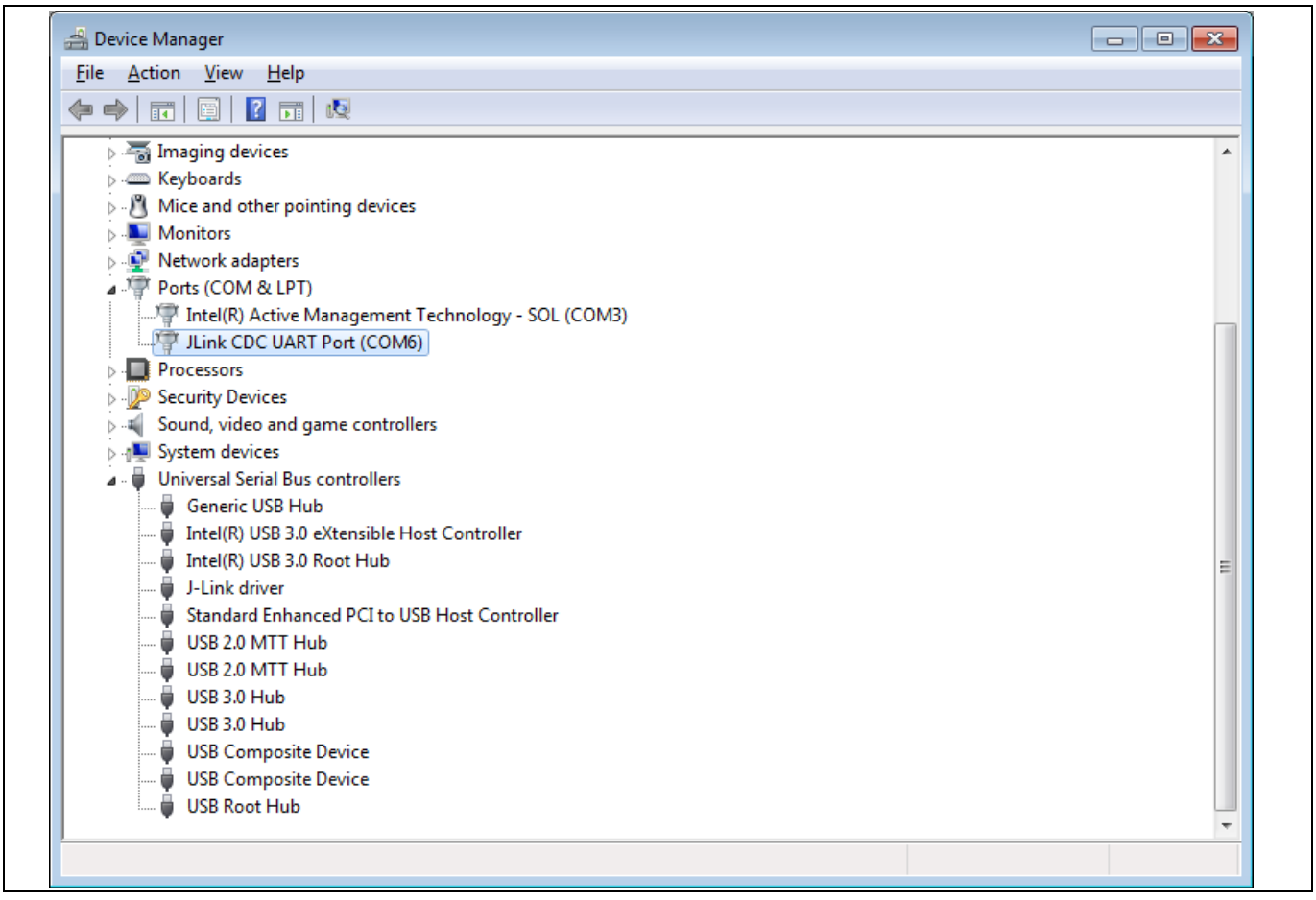

Figure 3 Correct installation of JLink UART Port

3.2 Firmware update using DAVE™

After download and extraction of the firmware example, do the following in DAVE™:

Step 1: Open DAVE™, go to “File” – “Import”. Then select “Infineon” – “DAVE project” and click “Next”. See Figure 4 for details.

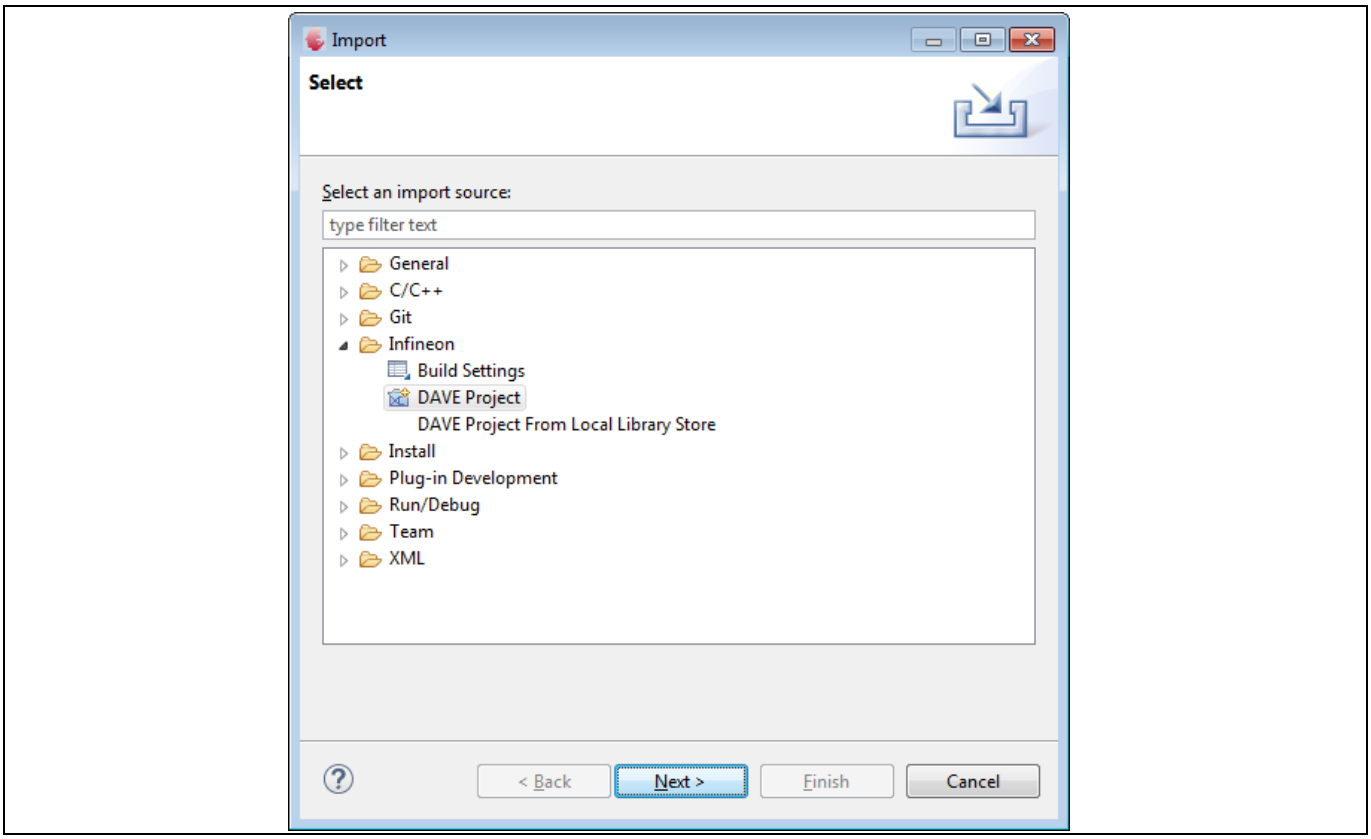

Figure 4 Import project

Step 2: Select the folder with the extracted demo project and click on “Finish”. Keep “Copy Projects Into Workspace” checked (see Figure 5).

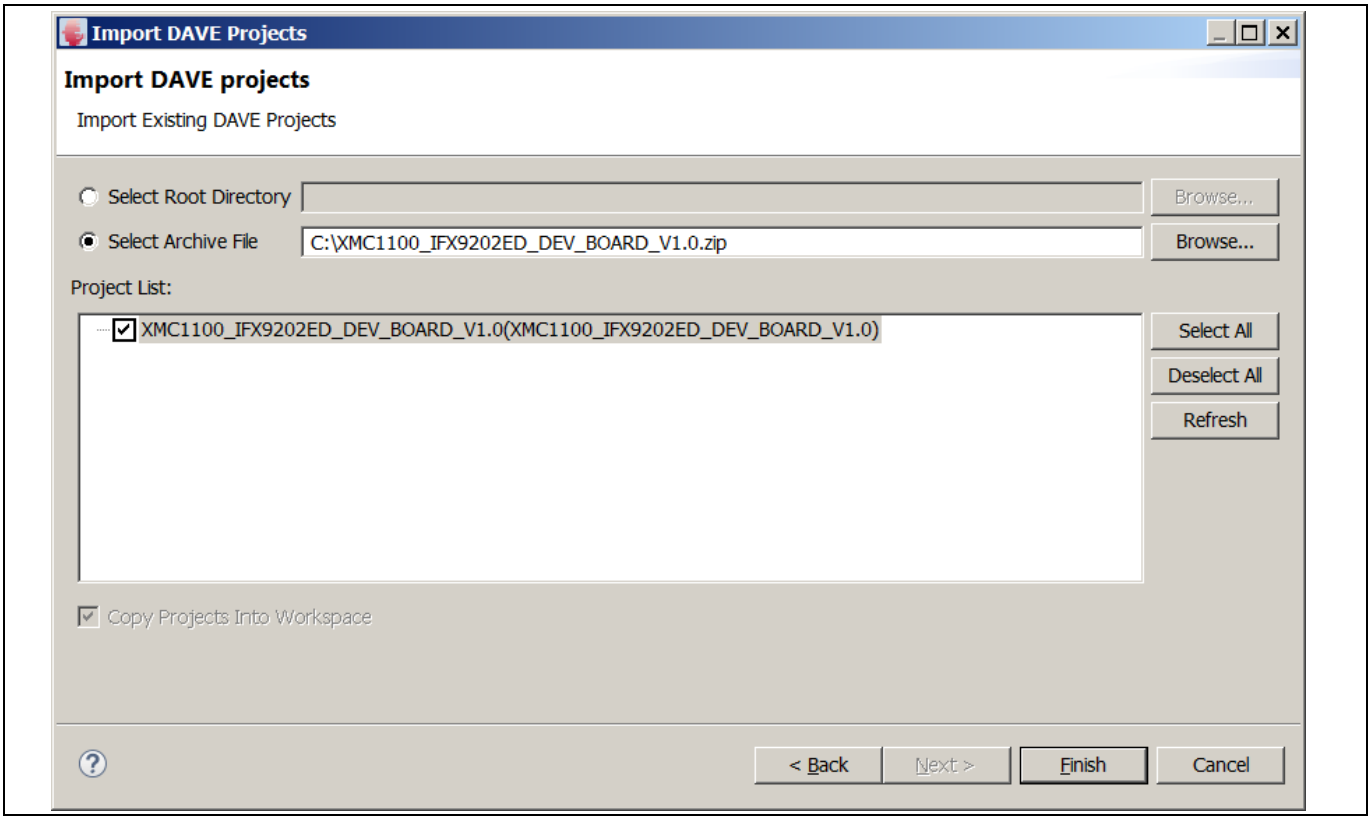

Figure 5 Import project (2)

Now the demo project will be imported. The screen should look like in Figure 6.

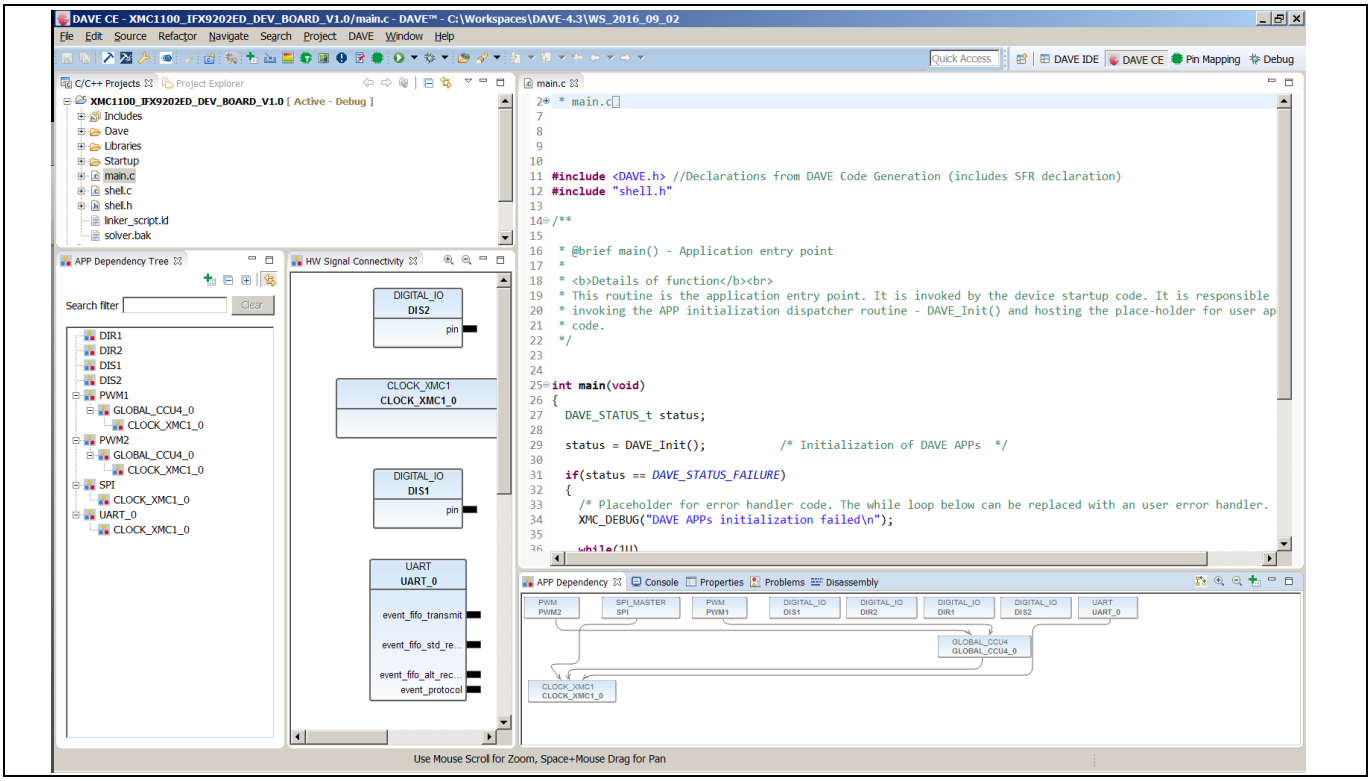

Figure 6 DAVE Screen after import of demo project (main.c selected)

Step 3: When connecting the XMC1100 Boot Kit (with the Dual H-Bridge shield with IFX9202 on top) to a USB port (unless already done), the green LED (D11) on the shield will be on to indicate logic supply is available. The supply for the power stages needs to be applied separately via VBAT and GND. Make sure all supplies and a load are connected.

Step 4: In DAVE™, click on “Generate Code” and “Build Active Project”. Then click on the “Debug” button. The following screen will appear (see Figure 7). Select the project under “GDB SEGGER J-Link Debugger”.

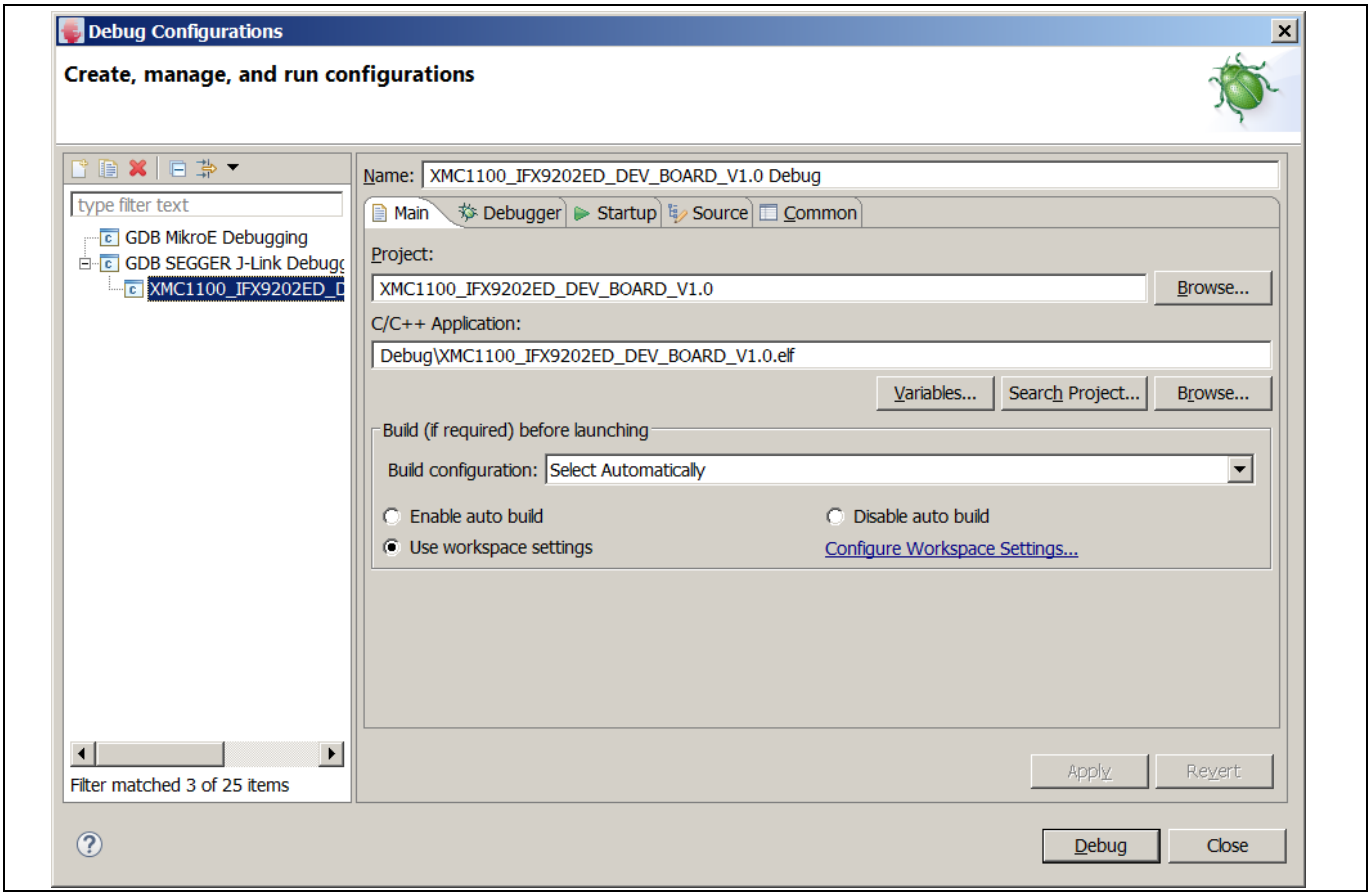

Figure 7 Debug Configuration

Step 5: Click on “Debug”. There may be a recommendation to update the J-Link interface. If you decide to go for the update, you may need to reconnect the board to the PC and repeat some of the previous steps after the update is complete. The demo firmware is now installed on the board. You can close DAVE™.

3.3 Operation via Terminal interface

Open the Terminal software (the example uses TeraTerm, however you can use any other Terminal software). Select serial interface and “JLINK CDC UART Port”. See Figure 8.

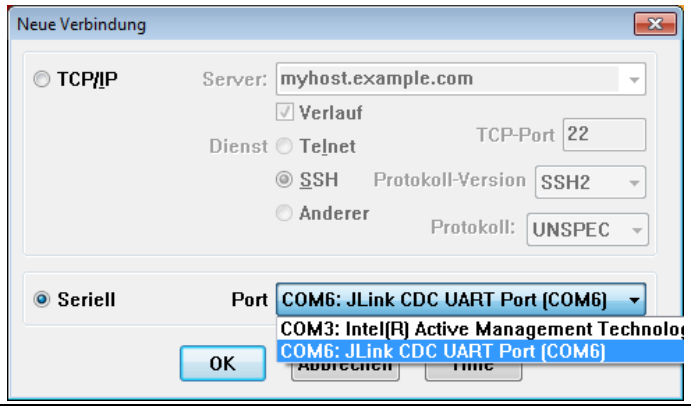

Figure 8 Select "JLINK CDC UART Port"

The port now needs to be configured according to Figure 9.

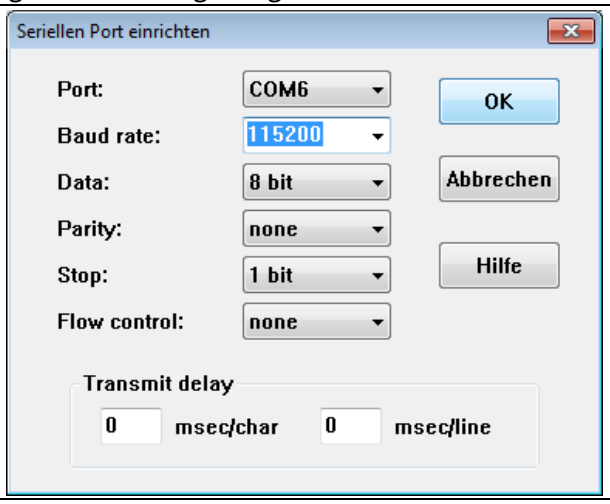

Figure 9 Set up serial port

After completing the above steps, type in "?" to make sure communication is working. A command overview as shown in Figure 10 or Table 1 is displayed.

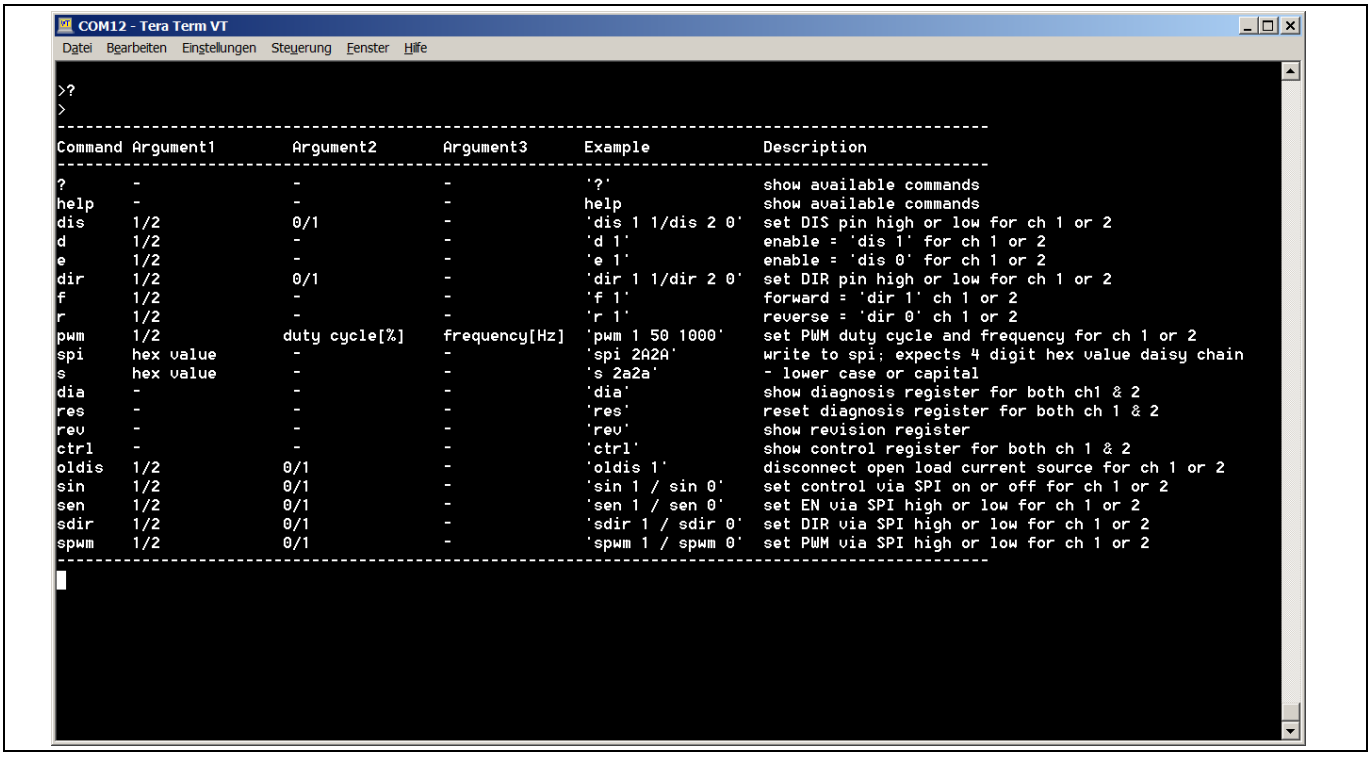

Figure 10 Command overview, displayed when “?” or “help” is entered

Table 1 Command list

Command	Argument 1	Argument 2	Argument 3	Example	Description
?	-	-	-	'?'	Show available commands
help	-	-	-	'help'	Show available commands
dis	1/2	0/1	-	'dis 1' / 'dis 0'	Set DIS pin high or low for ch 1 or 2
d	1/2	-	-	'd'	Enable = 'dis 1' for ch 1 or 2
e	1/2	-	-	'e'	Enable = 'dis 0' for ch 1 or 2
dir	1/2	0/1	-	'dir 1' / 'dir 0'	Set DIR pin high or low for ch 1 or 2
f	1/2	-	-	'f'	Forward = 'dir 1' for ch 1 or 2
r	1/2	-	-	'r'	Reverse = 'dir 0' for ch 1 or 2
pwm	1/2	Duty cycle [%]	Frequency [Hz]	'pwm 50 1000'	Set PWM duty cycle and frequency for ch 1 or 2
p	1/2	Duty cycle [%]	Frequency [Hz]	'p 50'	Frequency is optional (default 1 kHz) for ch 1 or 2
spi	Hex value	-	-	'spi 2A'	Write to spi; expects 4 digit hex value daisy chain
s	Hex value	-	-	's 2a'	Lower case or capital
dia	-	-	-	'dia'	Show diagnosis register for both ch1 & 2
res	-	-	-	'res'	Reset diagnosis register for both ch1 & 2
rev	-	-	-	'rev'	Show revision register for both ch1 & 2
ctrl	-	-	-	'ctrl'	Show control register for both ch1 & 2
oldis	1/2	0/1	-	'oldis 1'	Disconnect open load current source for ch 1 or 2
sin	1/2	0/1	-	'sin 1' / sin 0'	Set control via SPI on or off for ch 1 or 2
sen	1/2	0/1	-	'sen 1' / 'sen 0'	Set EN via SPI high or low for ch 1 or 2
sdir	1/2	0/1	-	'sdir 1' / 'sdir 0'	Set DIR via SPI high or low for ch 1 or 2
spwm	1/2	0/1	-	'spwm 1' / 'spwm 0'	Set PWM via SPI high or low for ch 1 or 2

For example to activate channel 1 with 50% duty cycle and 2 kHz PWM, use the following sequence:

```
e 1
pwm 1 50 2000
```

4 Hardware Description

4.1 Schematics

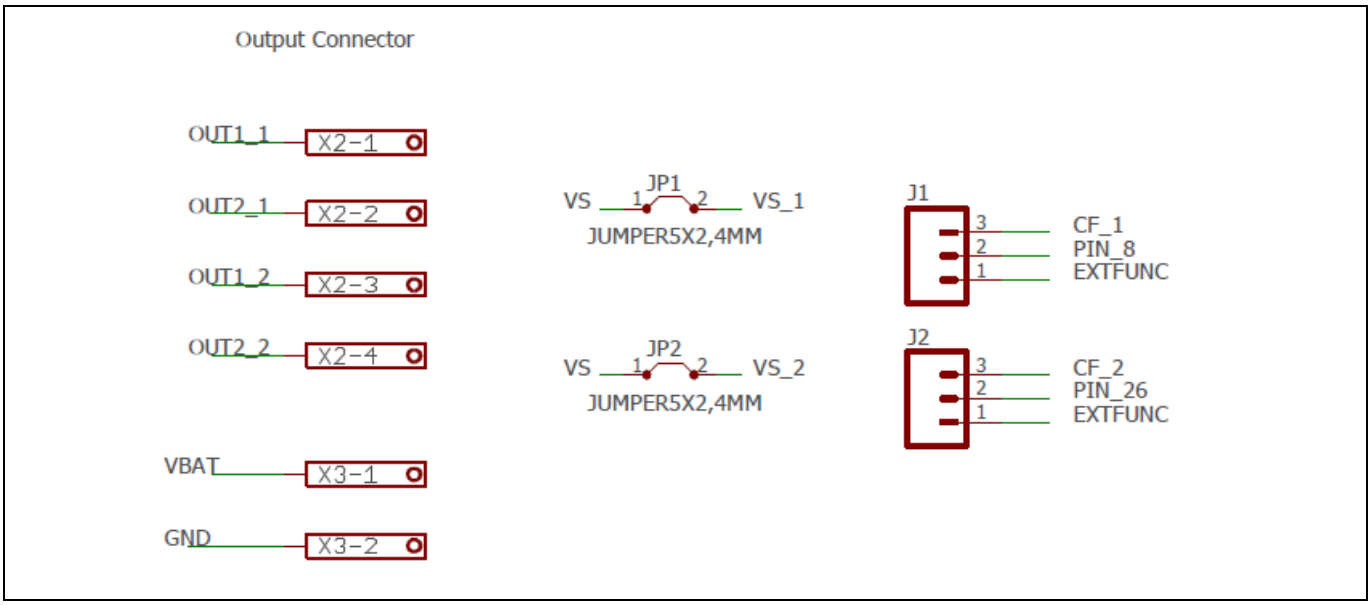

Figure 11 Screw connectors and jumpers

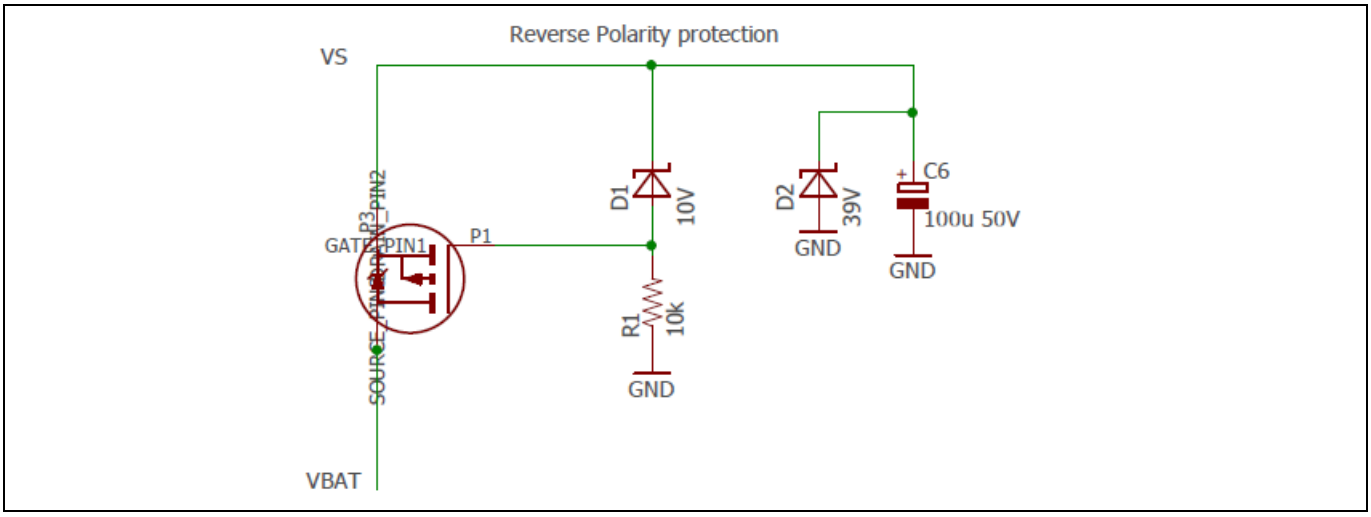

Figure 12 Reverse Polarity Protection

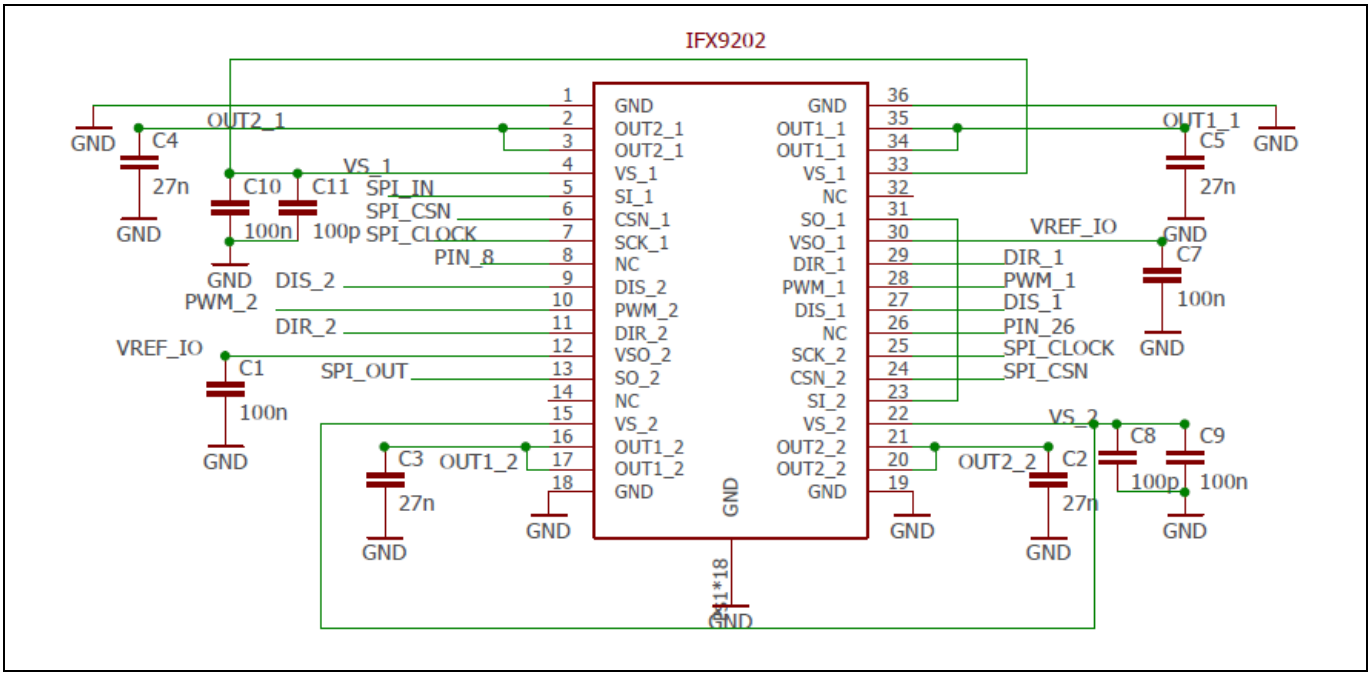

Figure 13 IFX9202 and Peripherals

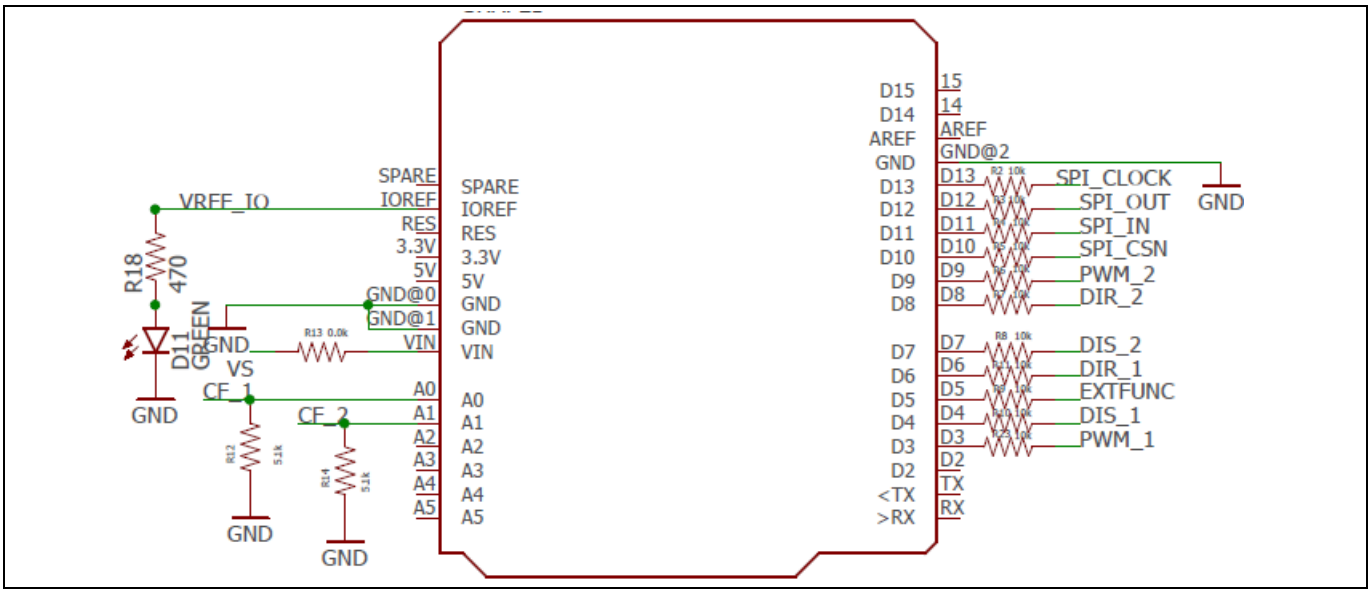

Figure 14 ARDUINO™ Pin Header and peripherals

4.2 Layout

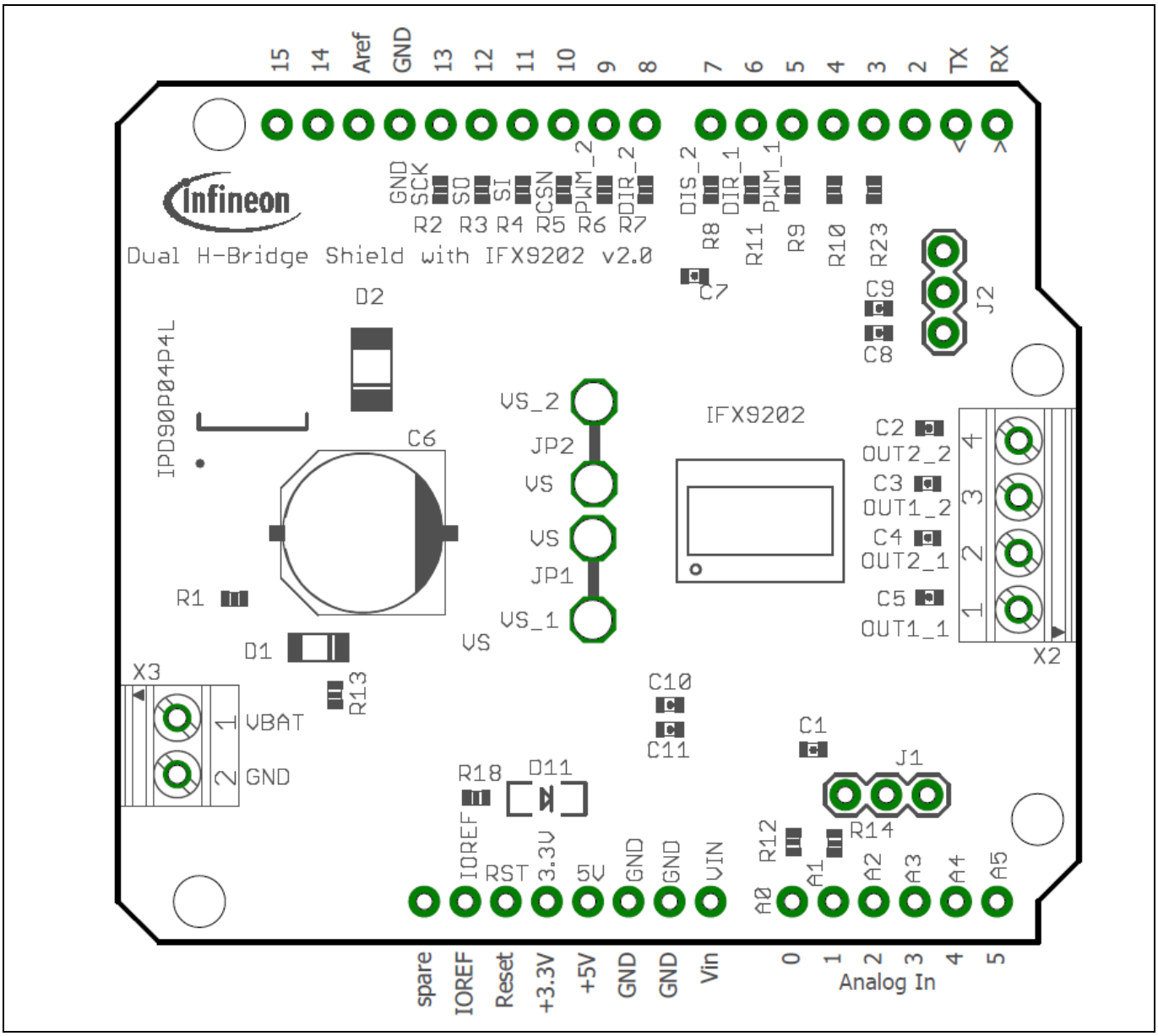

Figure 15 Component Placement

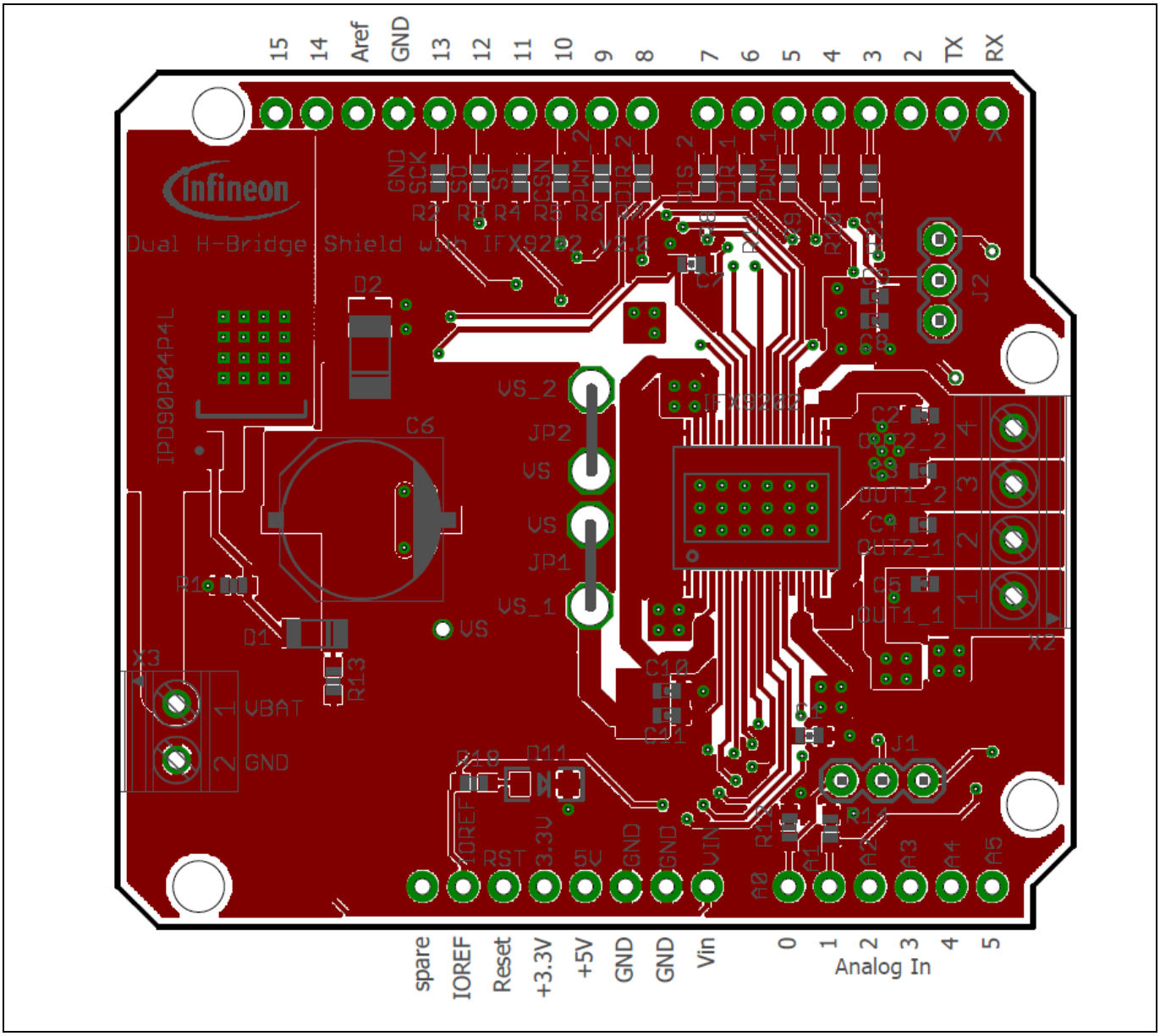

Figure 16 Top Layer

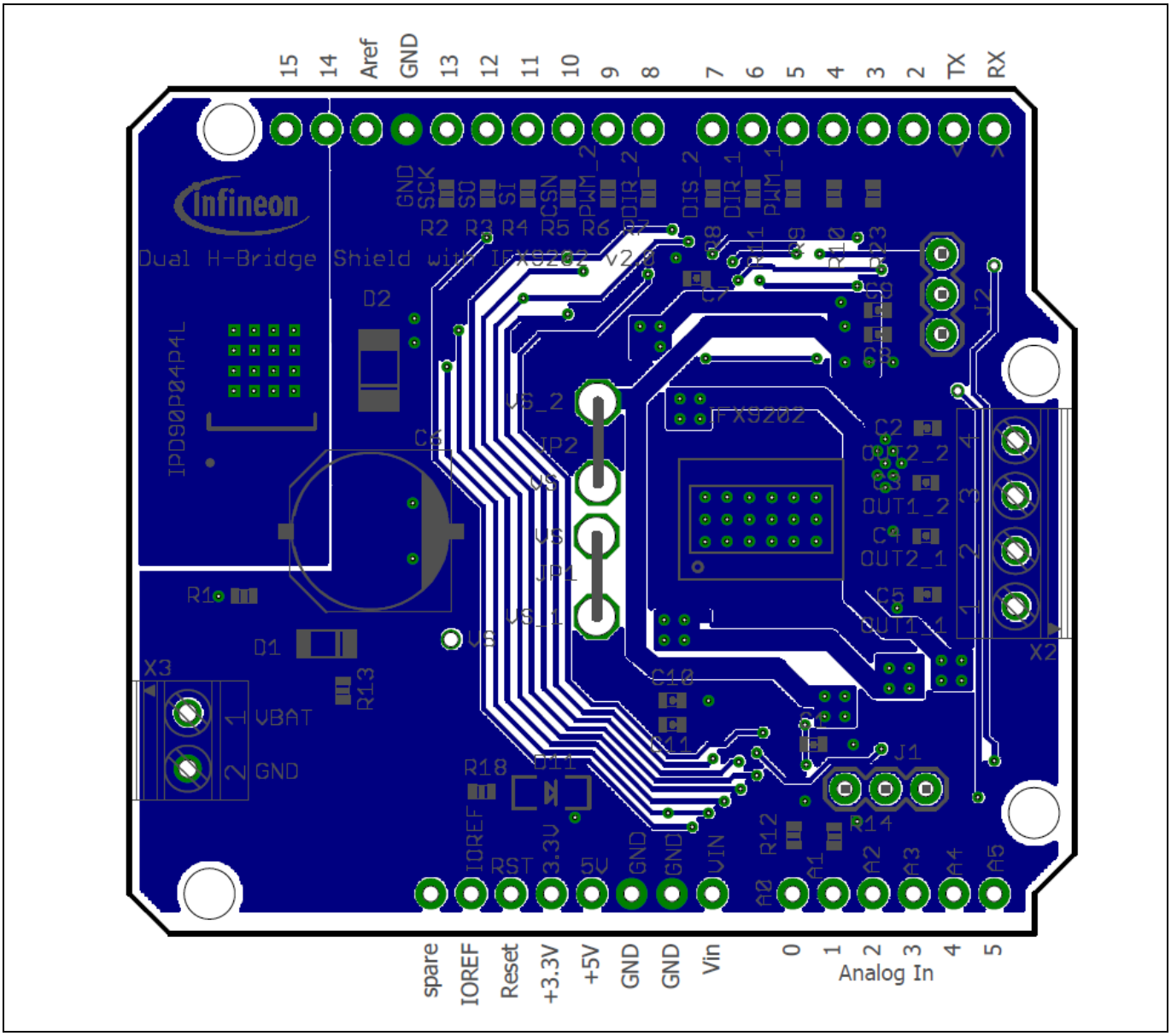

Figure 17 Bottom Layer

Note: The print on board version 2.0 is incorrect; PWM1 is located at D3, EXTFUNC (unused) at D5.

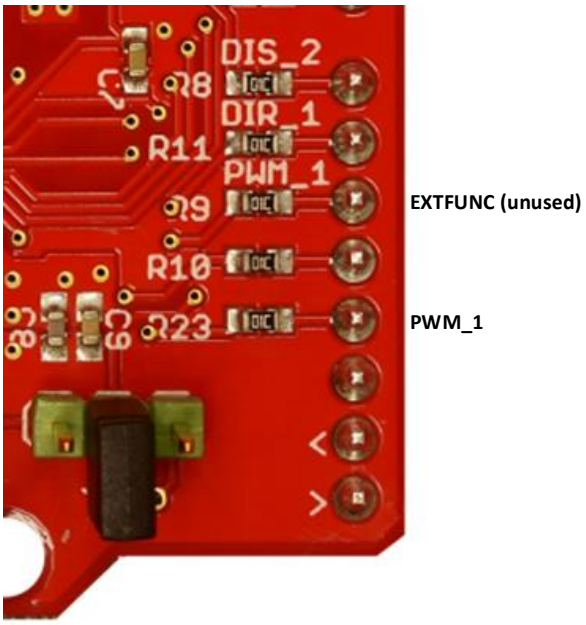

Figure 18 PWM_1 and EXTFUNC pins

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