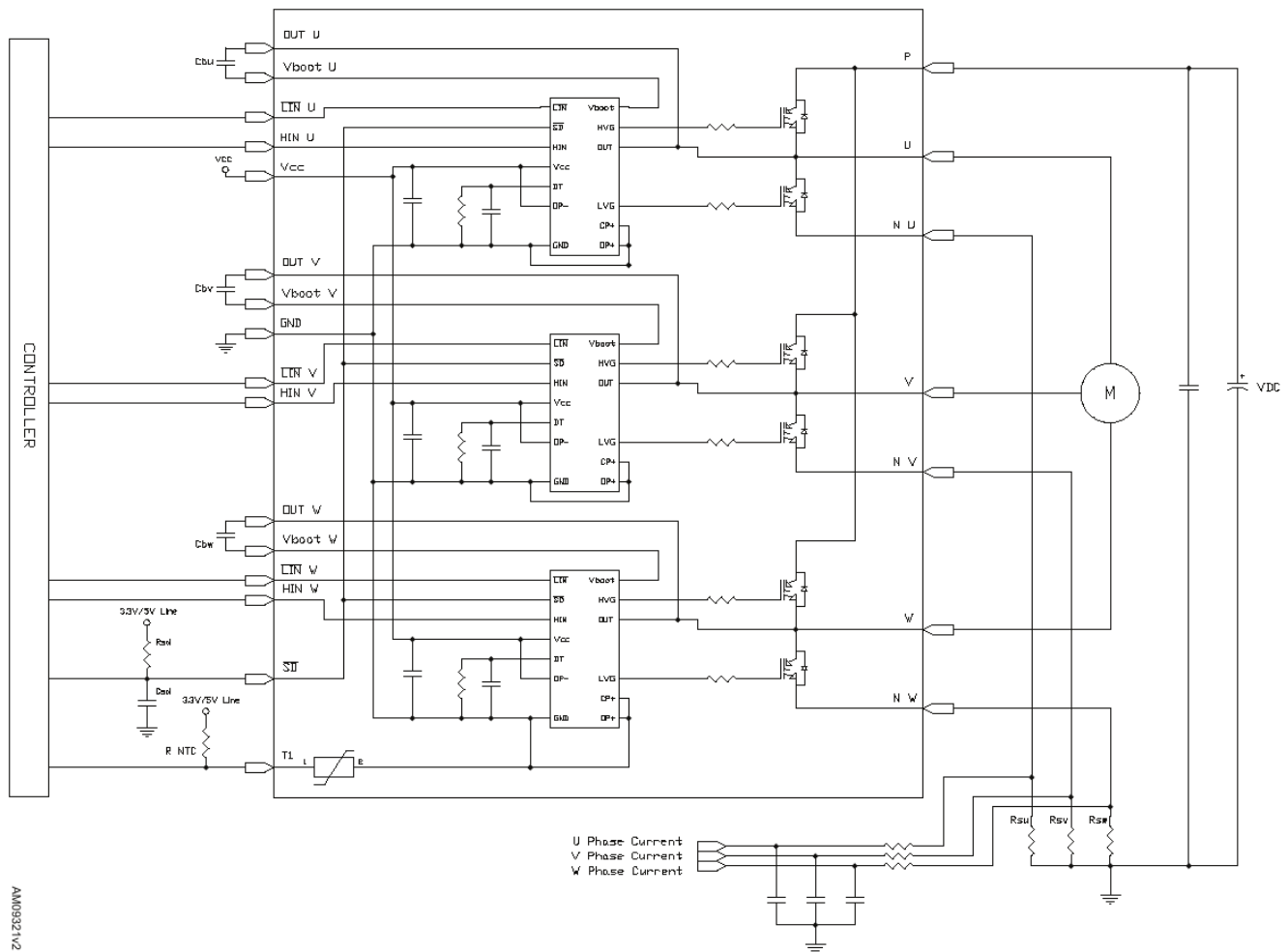


# Using an integrated 3 phase power module

In this lab you will connect an STM32 Nucleo development board to an ST Microelectronics inverter module. Before you start work you should familiarize yourself with the datasheet for the inverter (see reference section on Brightspace). Some points to note:

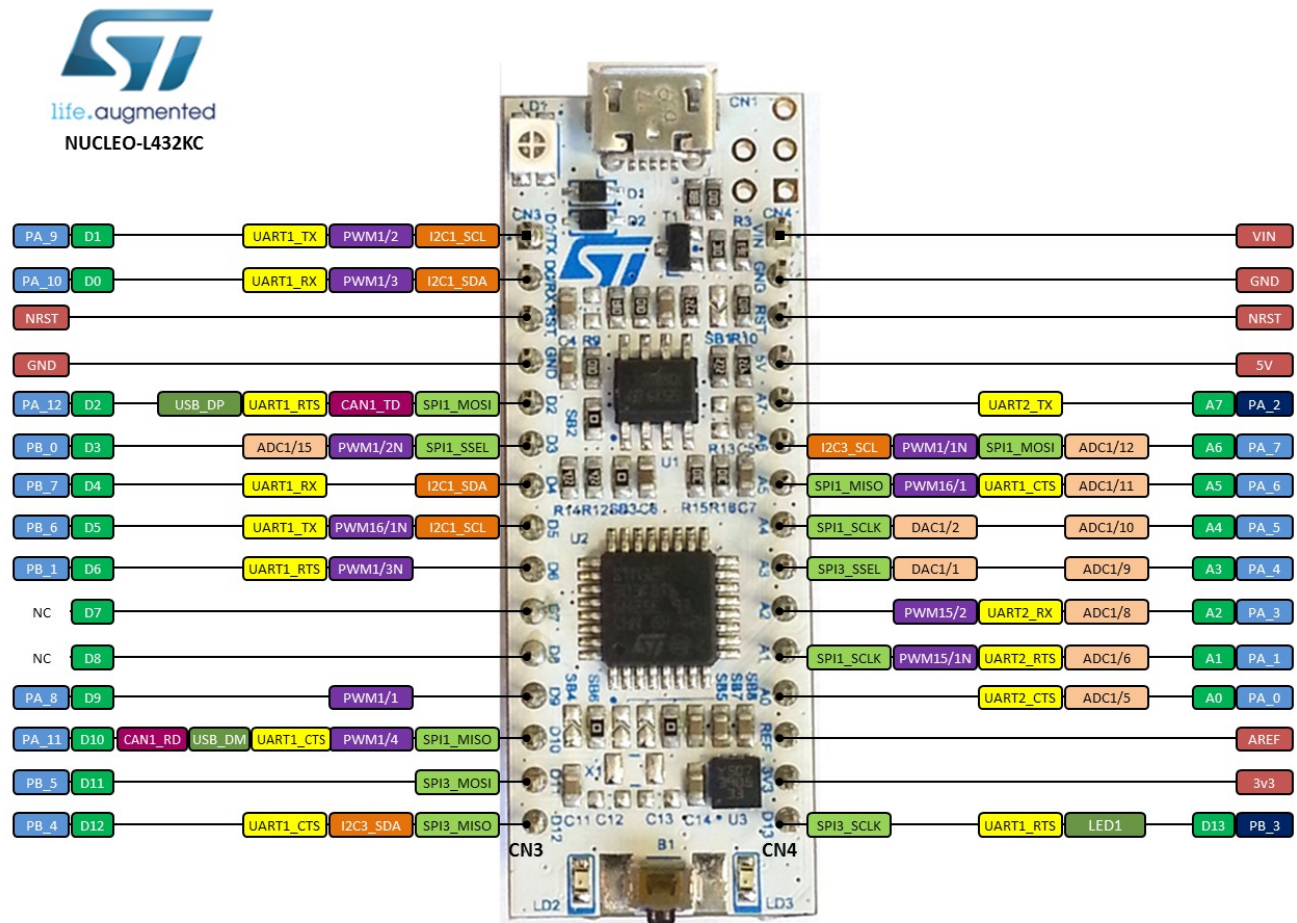
- Wire runs should be as short as possible.
- The minimum operating voltage of the bridge is approx 12V.
- The maximum voltage for the controlling electronics is approx 21V
- Be careful where you put the oscilloscope “ground”.
- The Shutdown input (nSD) should be pulled high with a resistor.

## Construction.



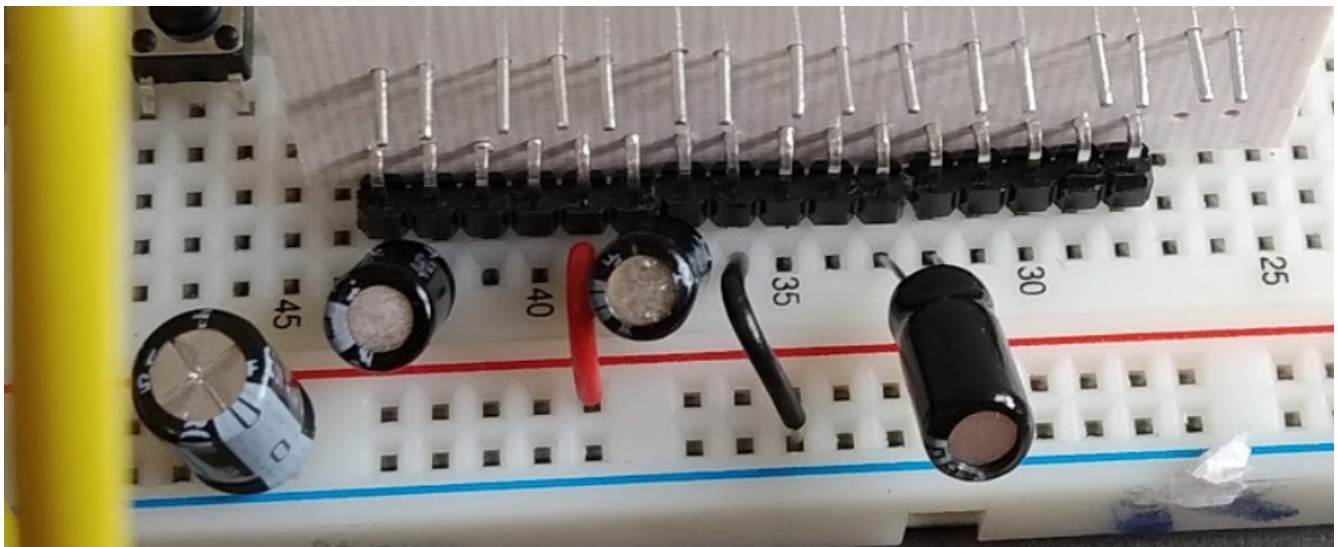
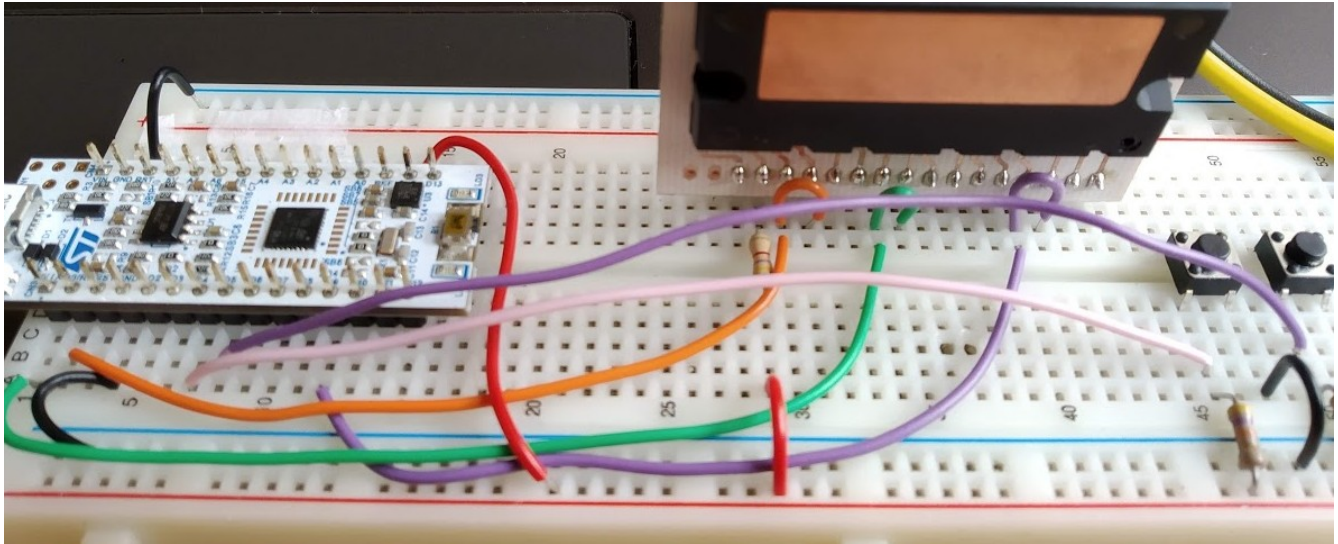
## I/O List for the STM32L432 board

Board label	Module Pin	PWM Function
D8	HIN U	PWM1/1
A6	Not used	PWM1/1N
D1/TX	HIN V	PWM1/2
D3	Not used	PWM1/2N
D0/RX	HIN W	PWM1/3
D6	Not used	PWM1/3N



The STM32L432's timer subsystem can generate complimentary output signals for each phase as shown in the table above. We will only be using the non-inverted signals and will let the power module take care of the signal compliments. This also forces us to use the dead (600ns) inserted by the power module. To do this HIN must be looped to nLIN for each of the phases.

The images below show the connections between the STM32L432 and the inverter module.



The bootstrap capacitors have been chosen to be 3.3uF in accordance with the datasheet (slightly bigger works too).

Two buttons are provided to allow you speed up and slow down the output frequency. The output voltage is also changed.

Mbed code is available here: <https://os.mbed.com/teams/ArmfulKST/code/SPWM1/>

## Things to measure

Plot of voltage outputs U and V relative to DC bus zero volts (at maximum output speed)

A low pass filtered version of the output (use a simple RC filter tapped off the U-phase output).

Record the amplitude of the output fundamental (see filter output) for 5 different output frequencies and plot (frequency on the X-axis).