Speeduino Compatible Motronic 1.3 ECU

DIY Kit Assembly Guide

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1. **Proper Use and Installation**: The Product is designed for specific purposes and must be installed, configured, and used according to the manufacturer's guidelines and instructions. You are solely responsible for ensuring that the Product is correctly installed and configured.
2. **No Liability for Misconfiguration or Damage**: EFI Customs assumes no responsibility or liability for any damages, malfunctions, or performance issues related to the Product which are a result of misconfiguration, improper installation, misuse, or any alterations made to the Product by the user or a third party.
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Getting Started

Once you have received your DIY Kit, please check that you have received all contents by comparing against the Bill of Materials included.

You should have an extra component for every resistor, capacitor, diode, and external connector pins. If you are missing anything, please get in touch with us at admin@eficustoms.com.au immediately, quoting your order number and we will send out any missing parts.

Please keep in mind that some of the components you have received may not match the appearance of the ones displayed in the pictures below. This is completely normal and is usually due to supply related issues. Rest assured that the components you have received are equally as compatible.

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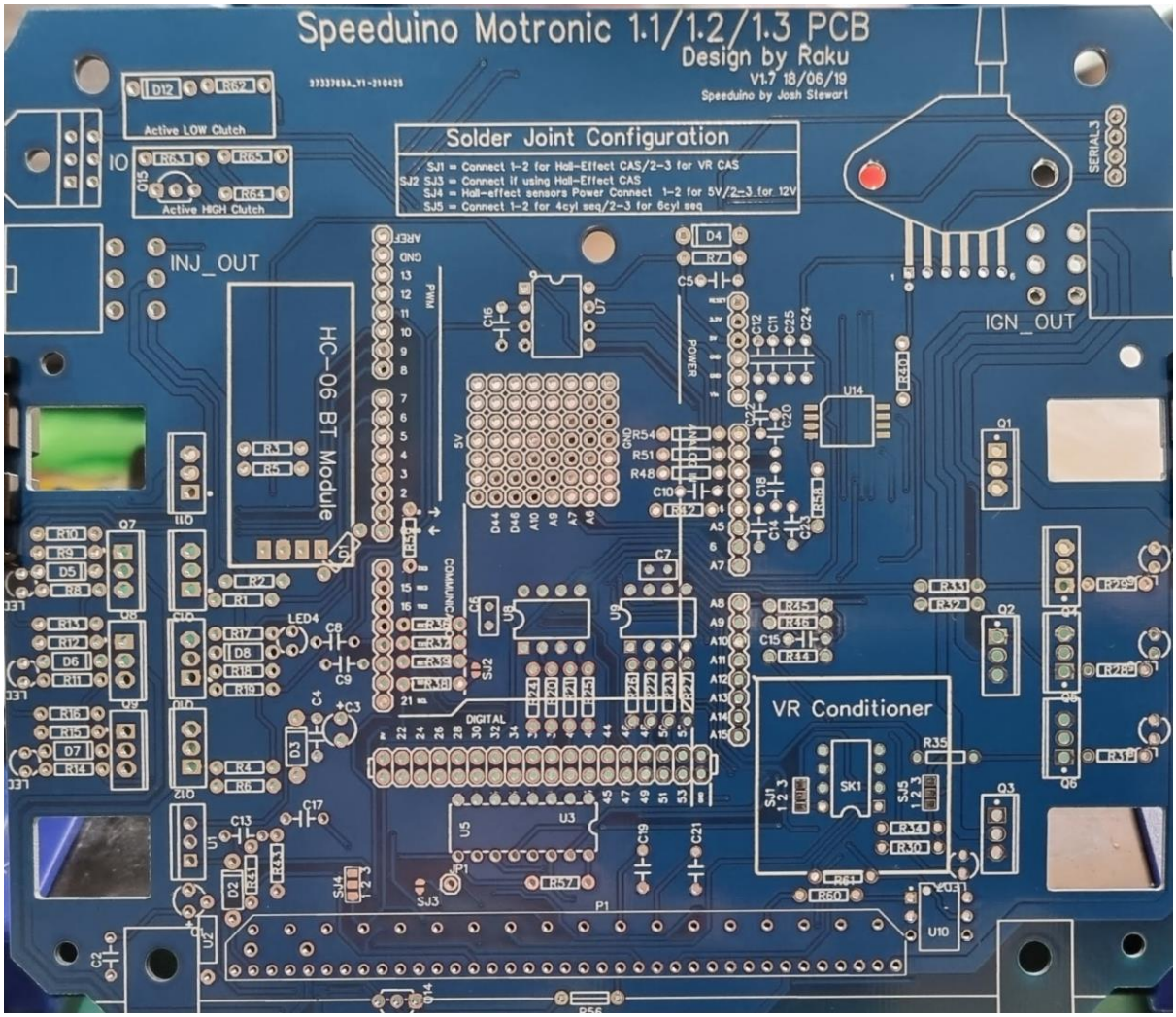
Recommended Assembly Instructions



Starting off with a blank board, this is what the general layout should look like for your Motronic 1.3 DIY kit.

It is recommended to start off with a bottom up approach where smaller, lower profile, components get installed first to ensure you have plenty of access for bigger components and access for your soldering iron without damaging anything.

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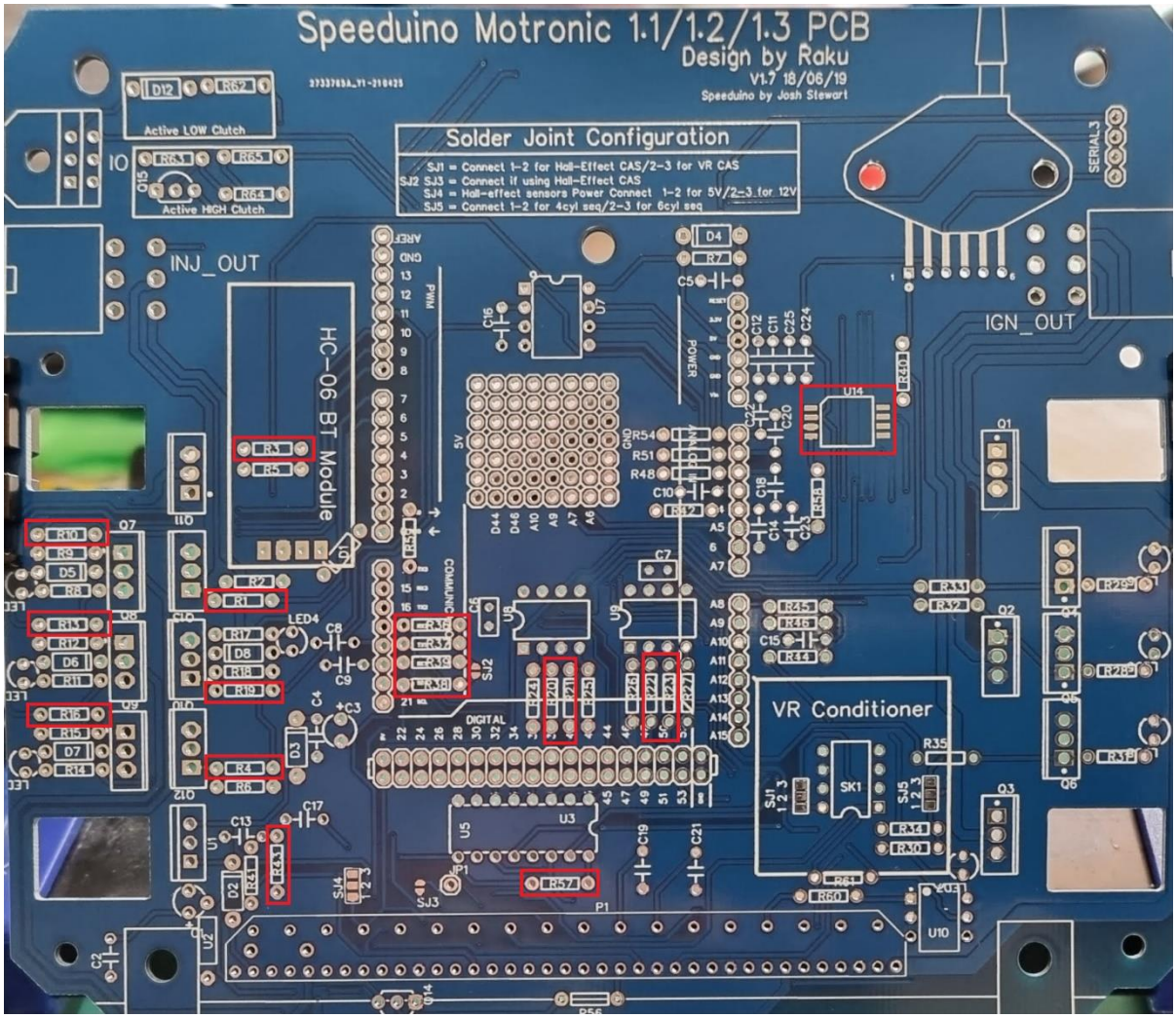
Resistors



Let’s populate the first group of resistors along with the barometric pressure sensor (not pictured in this guide). Please note that the barometric pressure sensor has a corner notch that should match the silkscreen on the board.

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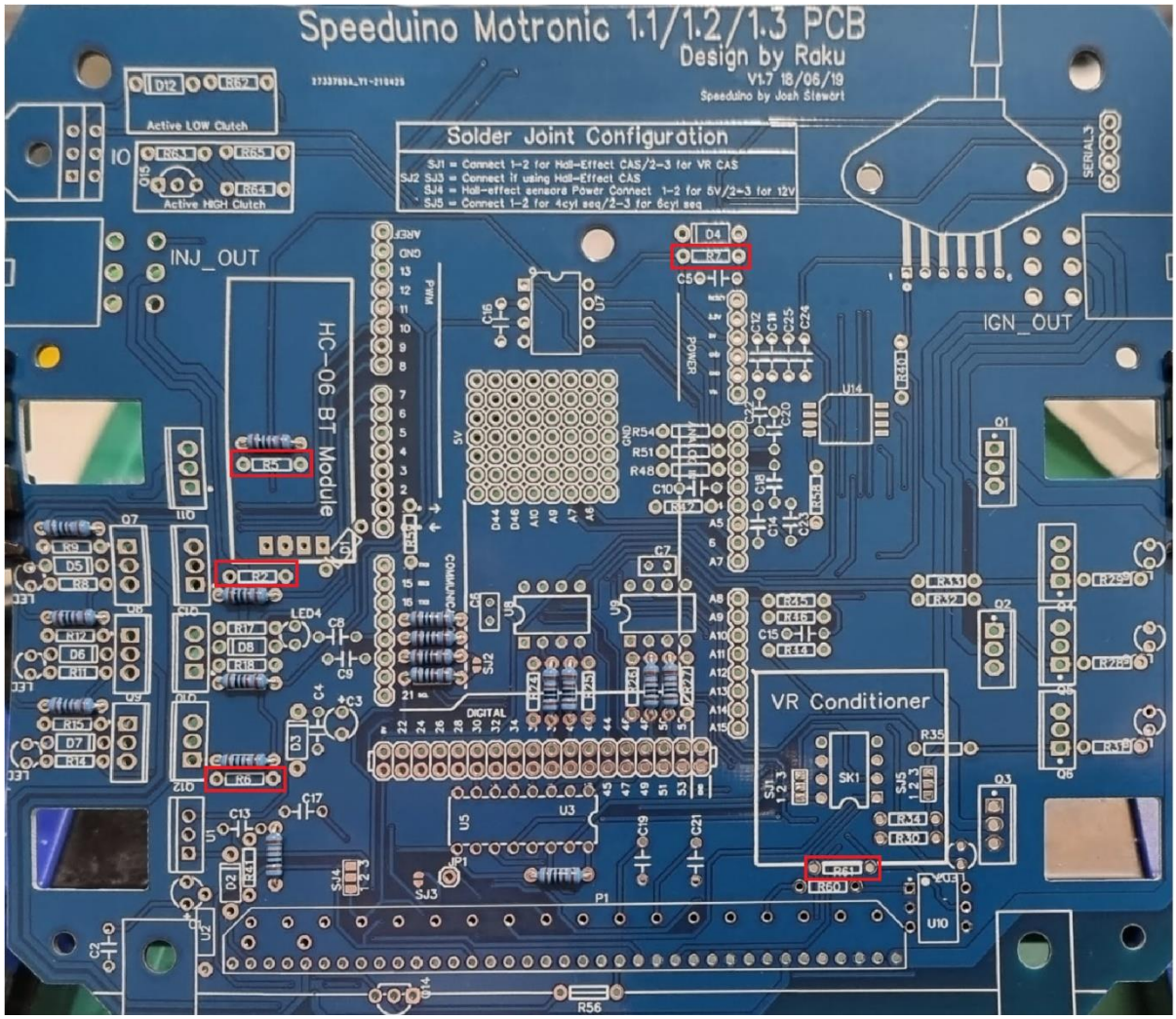

Now let’s populate the second group of resistors.

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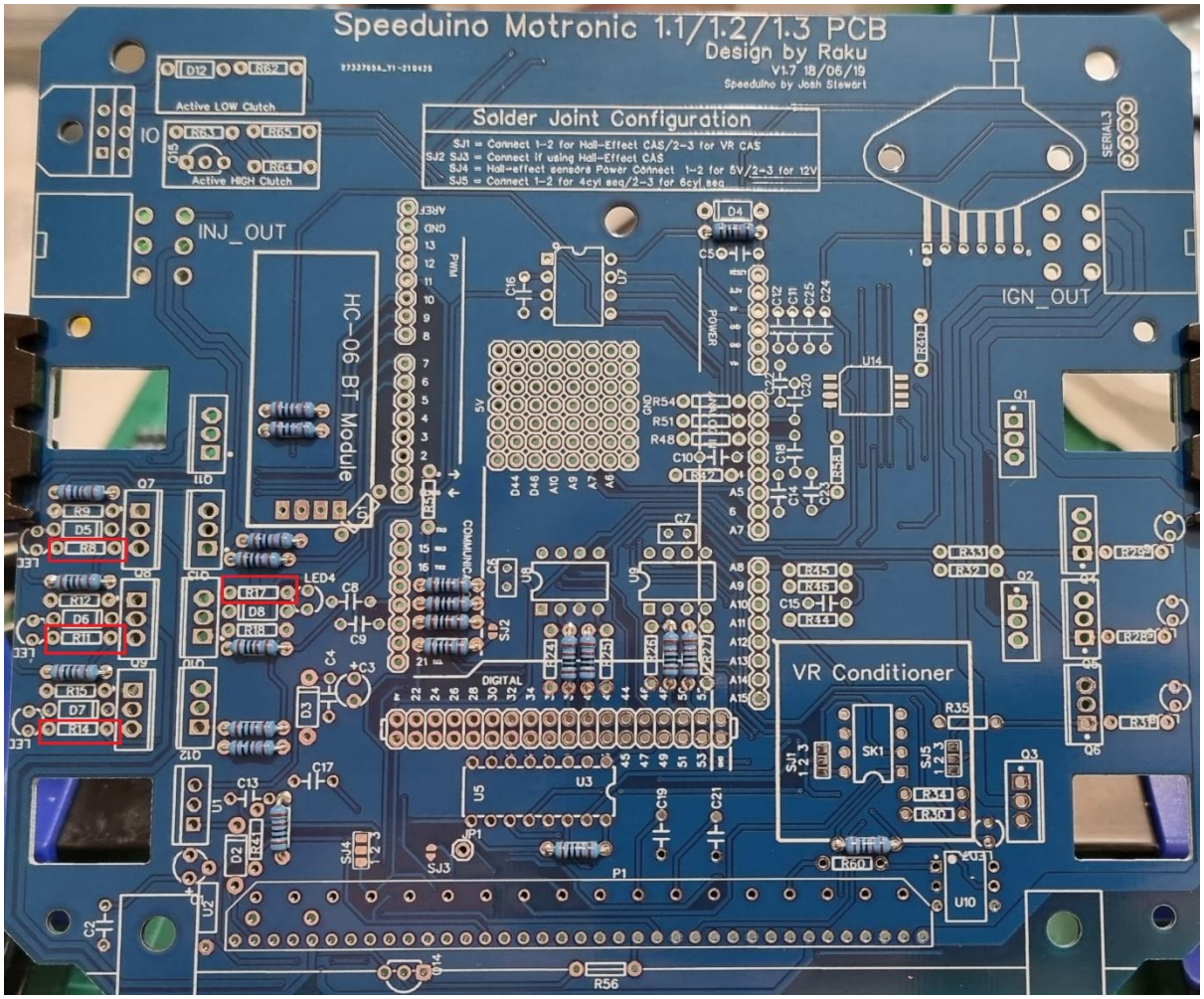

The third group of resistors.

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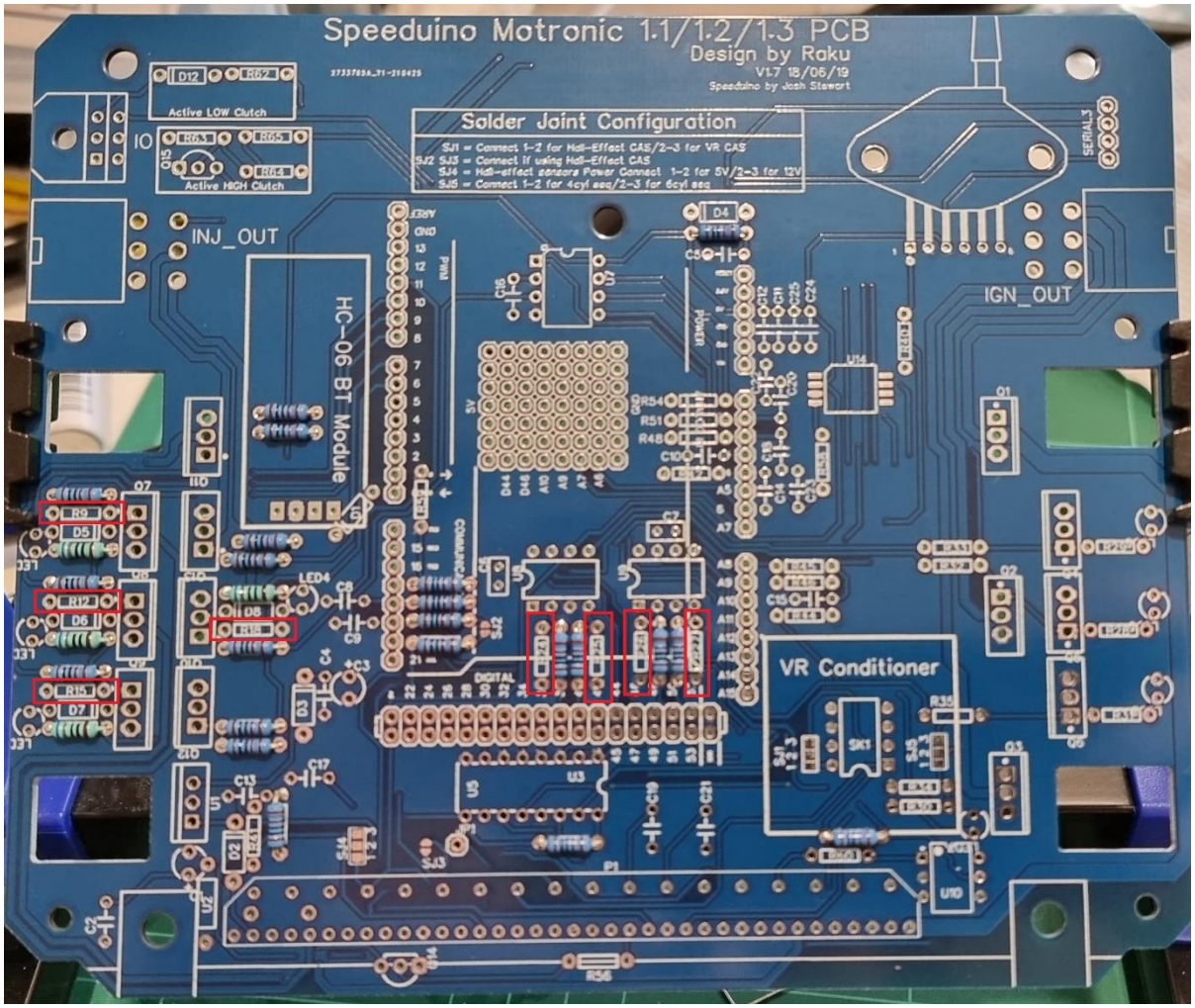

The fourth group of resistors.

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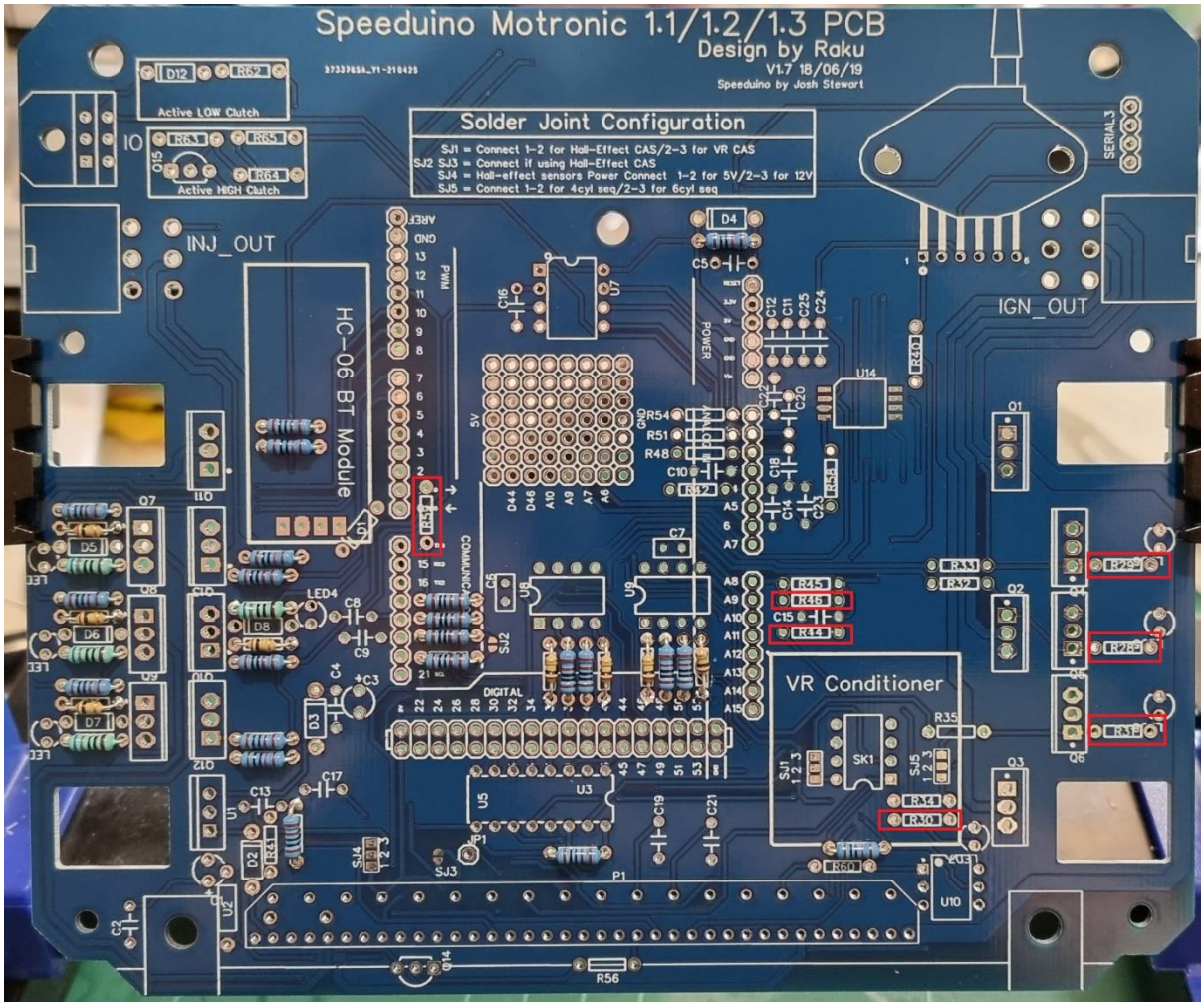

The fifth group of resistors.

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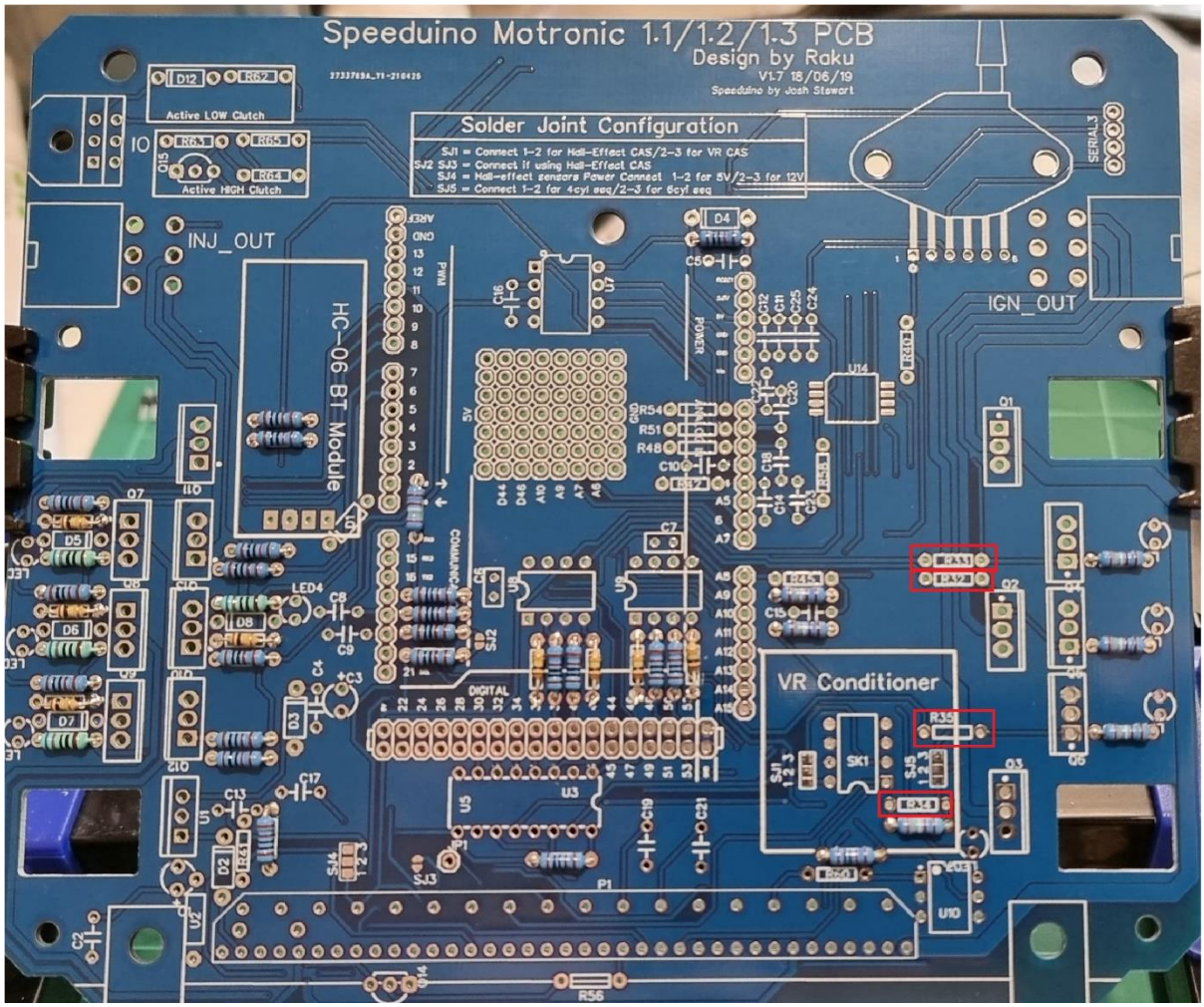

The sixth group of resistors.

Please note that the resistors you have received are rated for 2W rather than the typical 1/4W used for other resistors. As such, their footprint is bigger and they don't fit flat against the board. You can put the first leg in all the way and then start feeding the second leg in, the resistor should sit at a slightly diagonal angle. Alternatively, you can guide both legs in at the same time and leave the resistor slightly suspended above the other ones.

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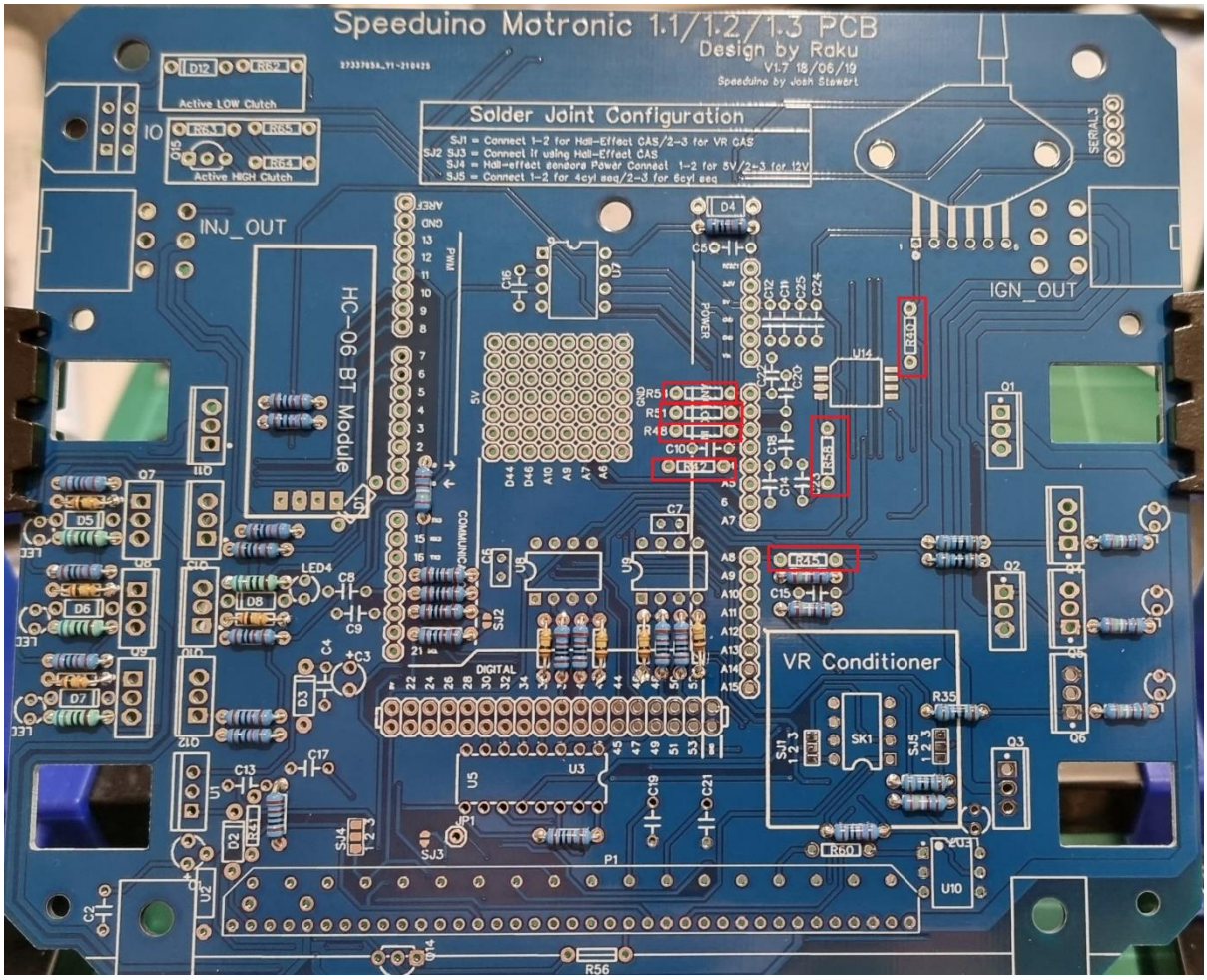

The seventh group of resistors.

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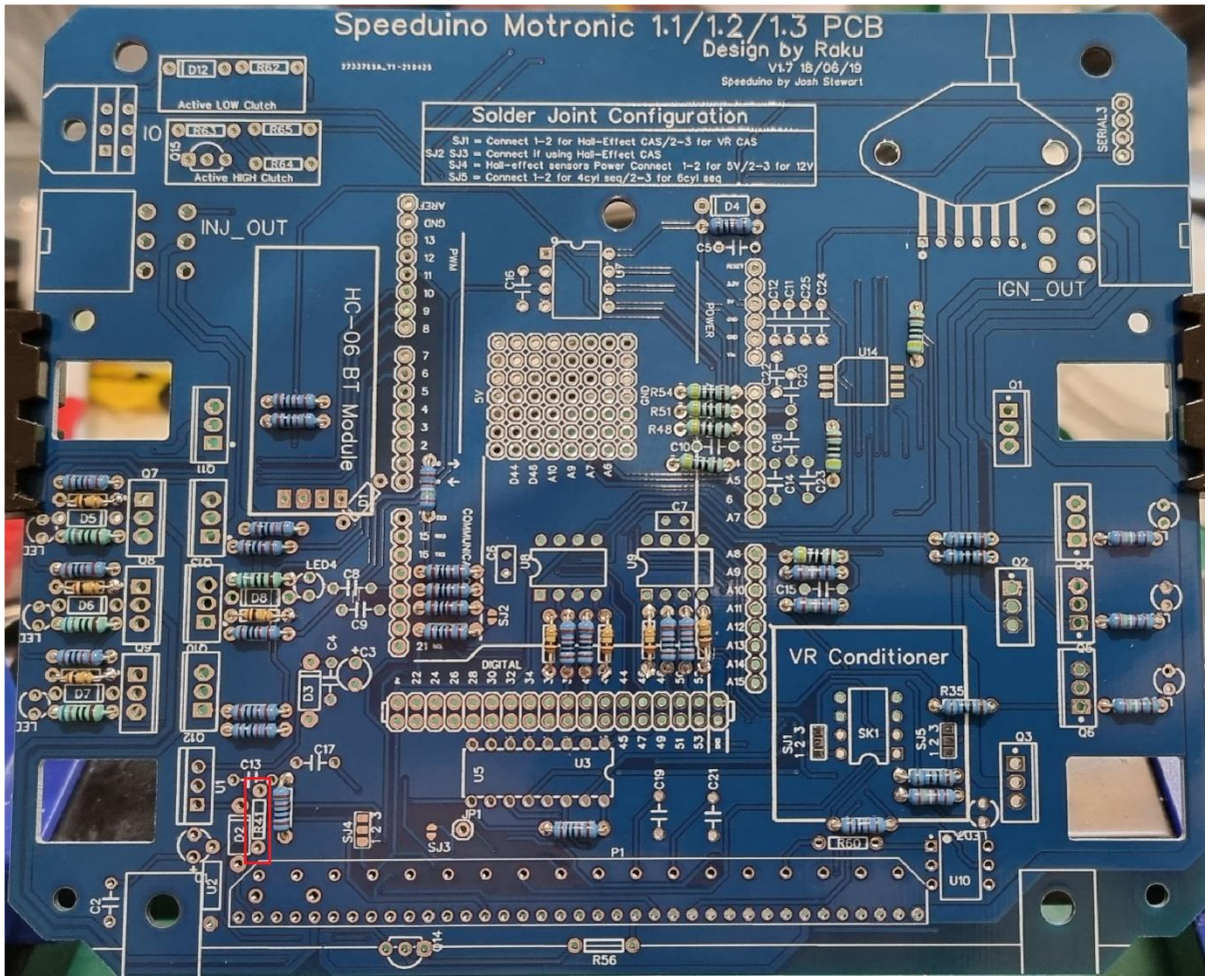

The eighth group of resistors.

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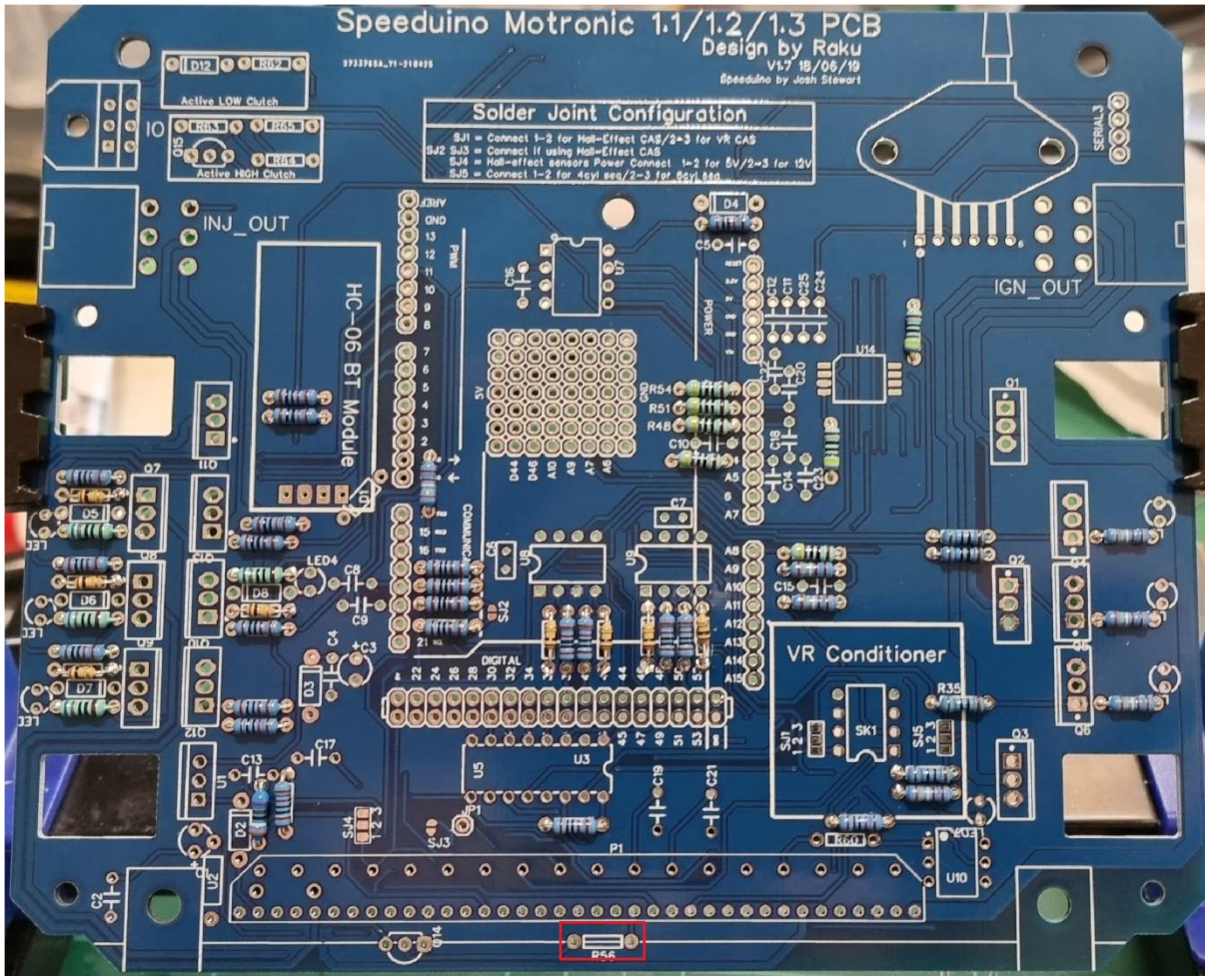

The ninth group of resistors.

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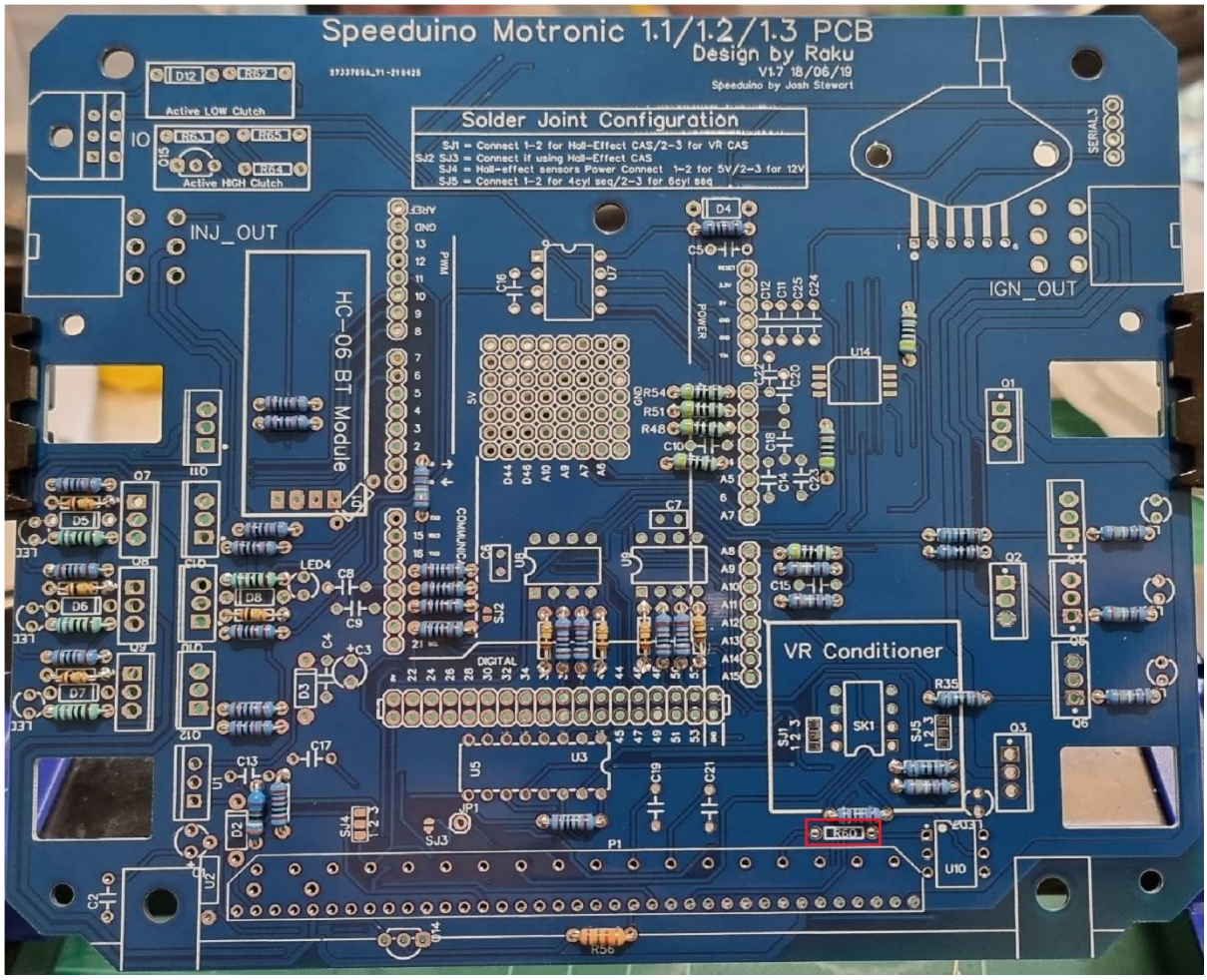

The tenth group of resistors.

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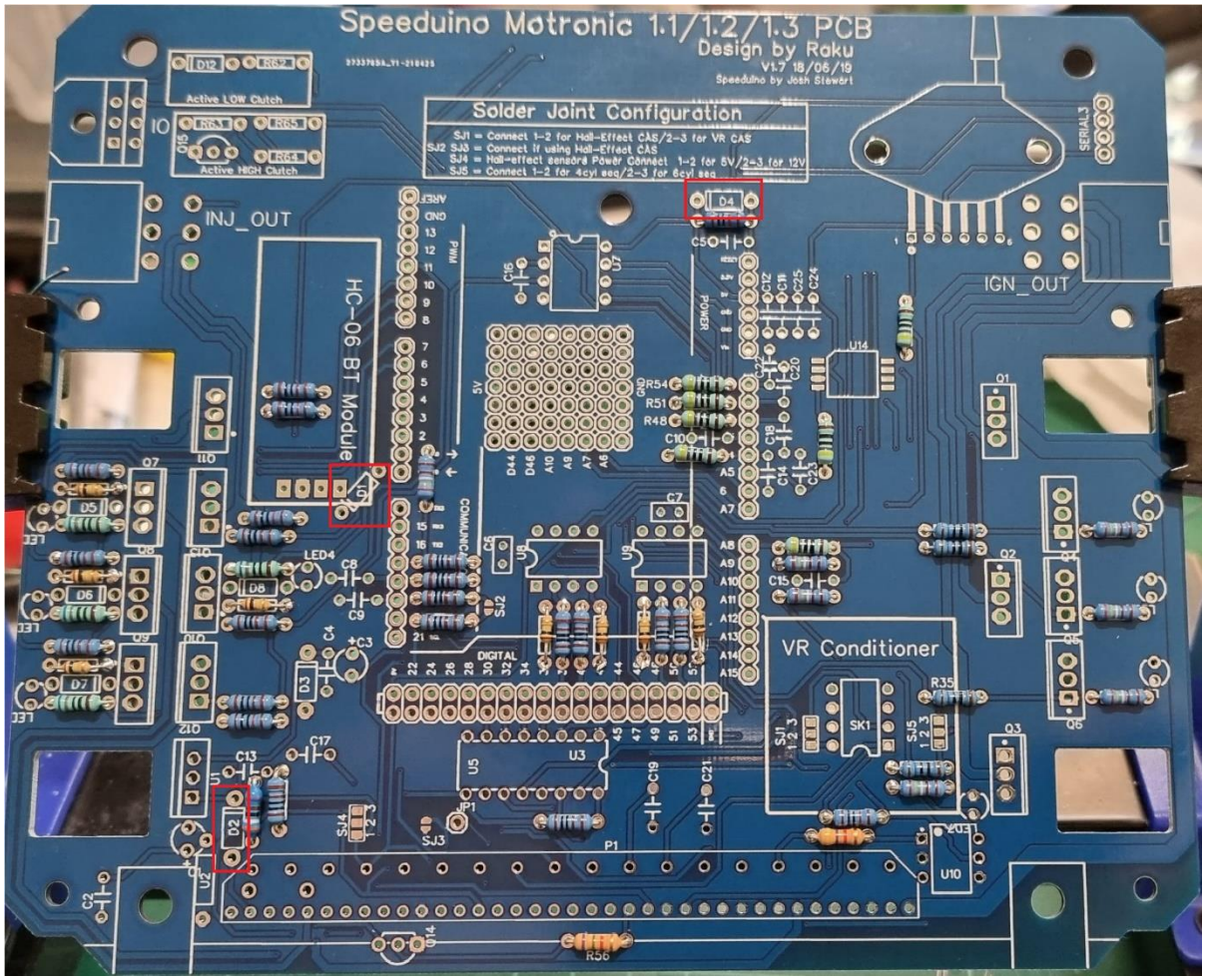
Diodes



The first group of diodes. Please note the silkscreen has an additional stripe on one side to indicate the orientation of the diode. Match the stripe on the diode to the stripe on the board.

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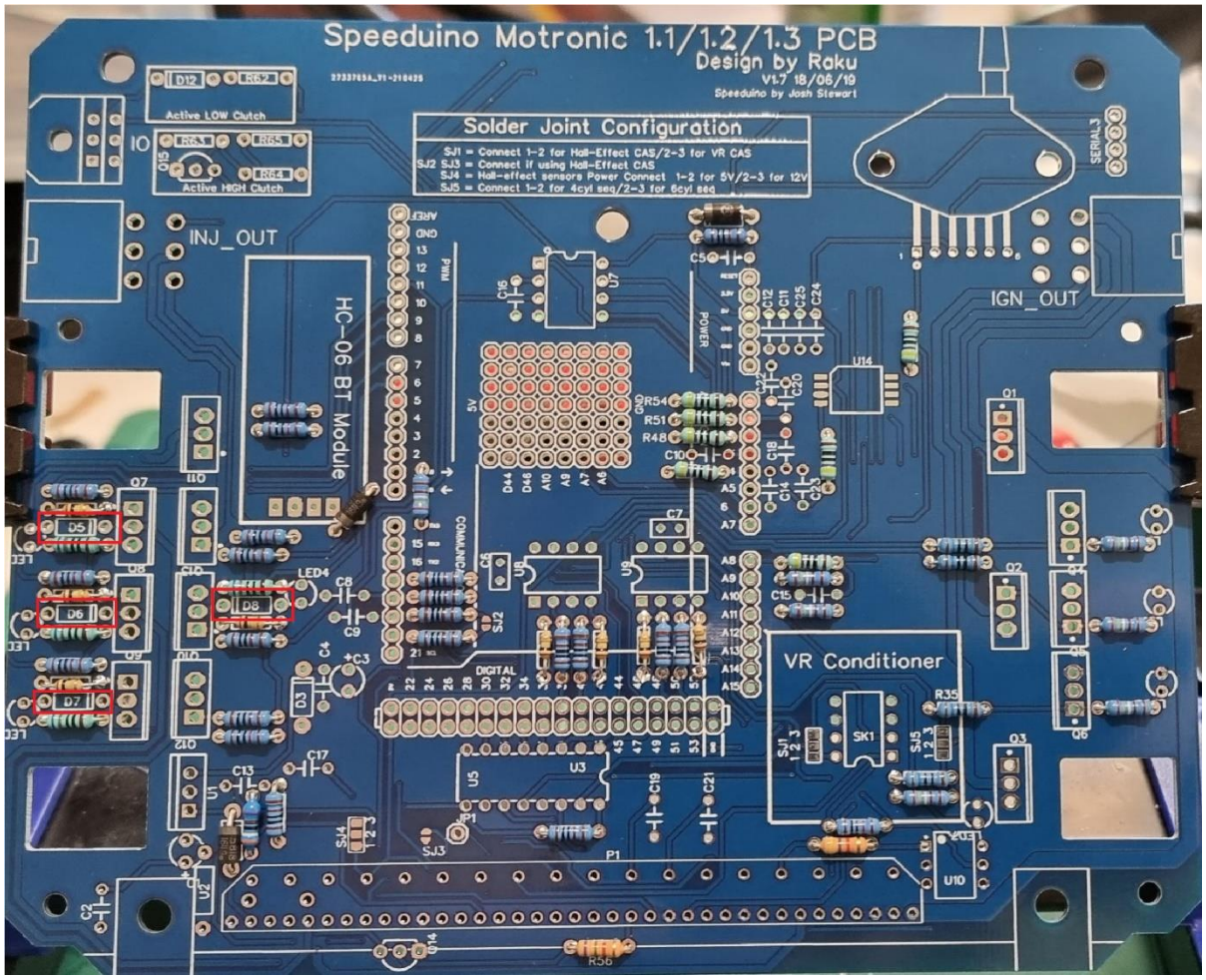

The second group of diodes. Please note that the Zener diodes use a black stripe rather than the silver stripe found on the Schottky diodes in the previous group.

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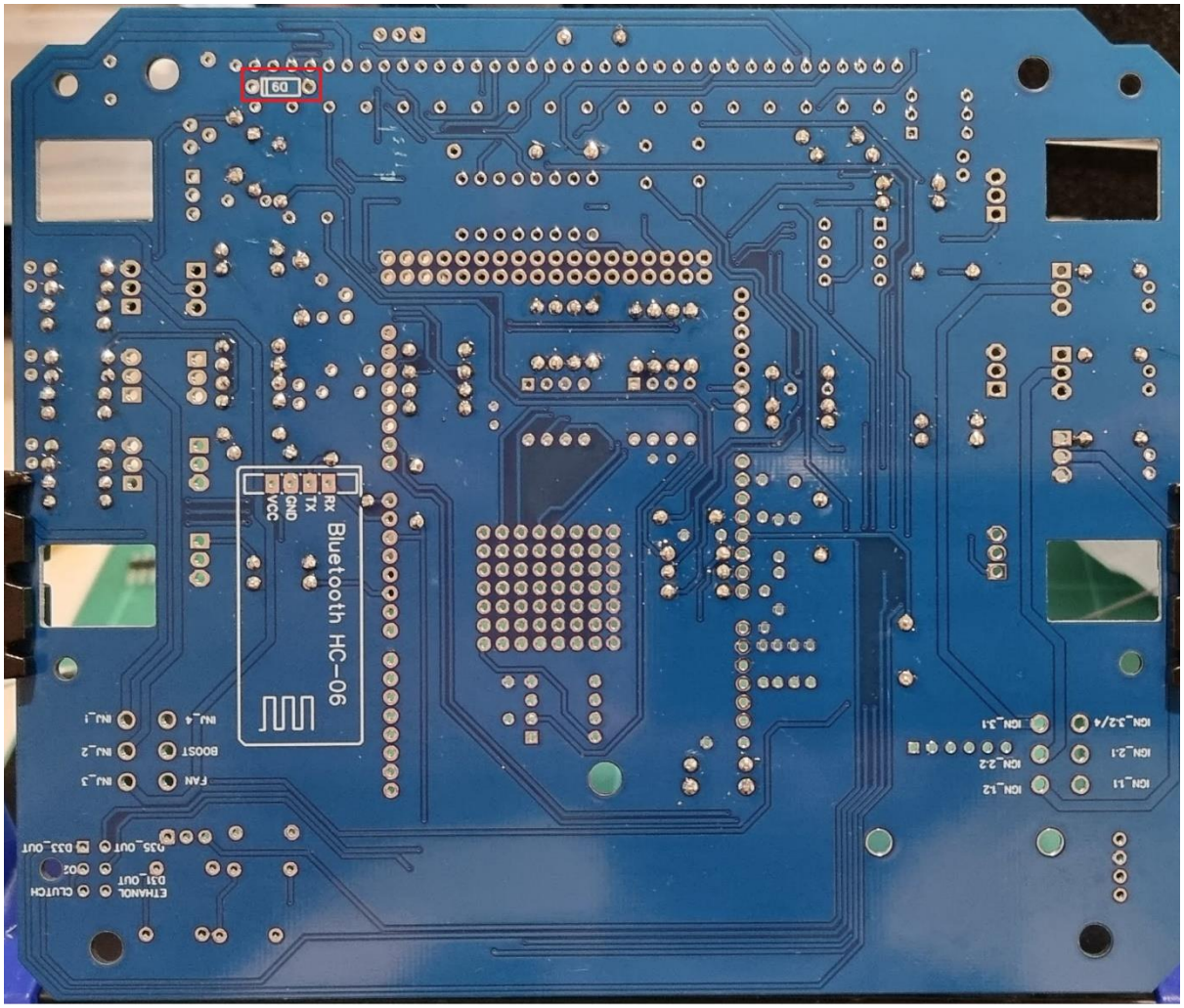

The third group of diodes. This one is located on the underside of the board. Please note the silkscreen has an additional stripe on one side to indicate the orientation of the diode. Match the stripe on the diode to the stripe on the board.

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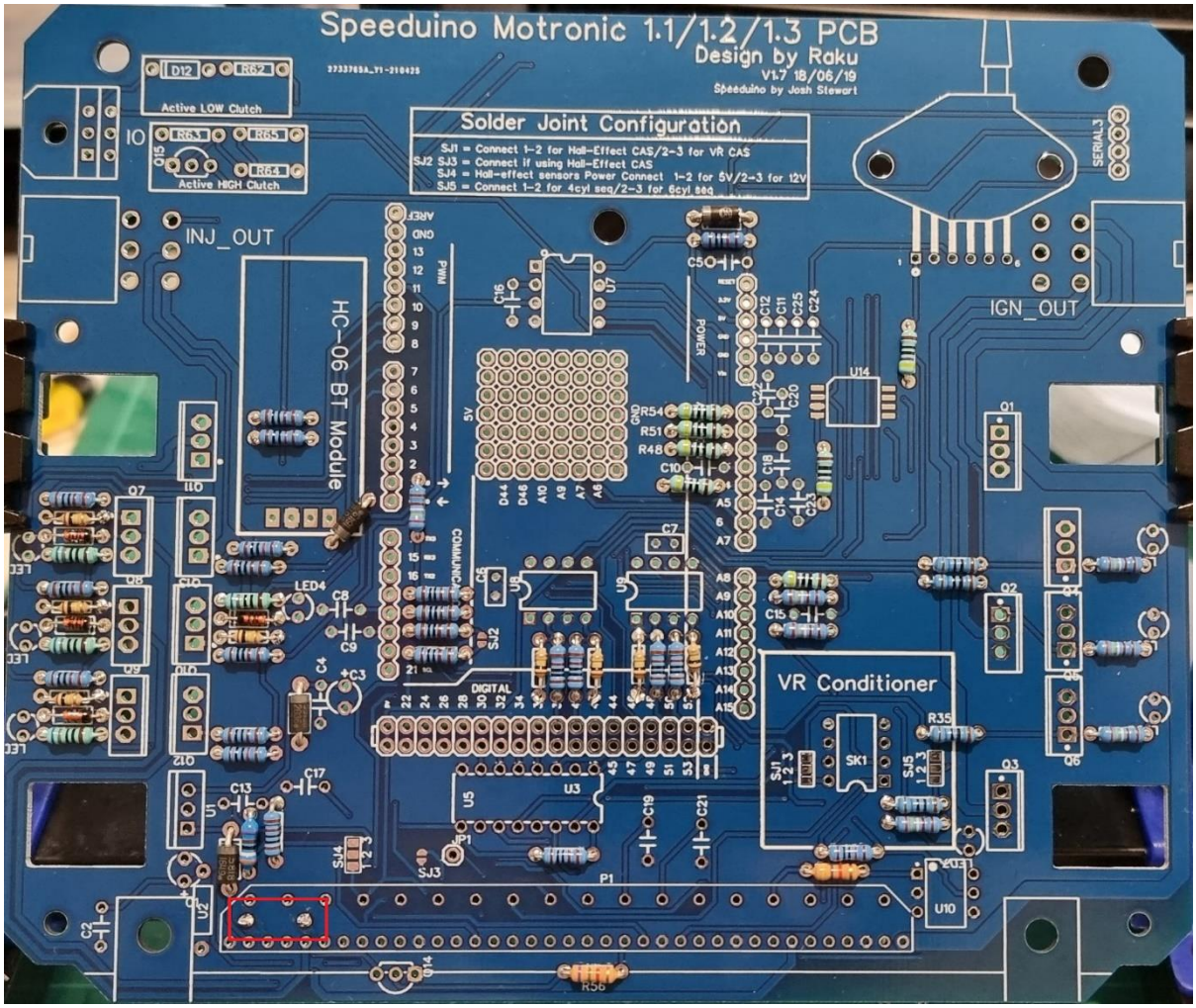

Ensure that the solder on the pads does not protrude too much to allow enough space for the ECU connector.

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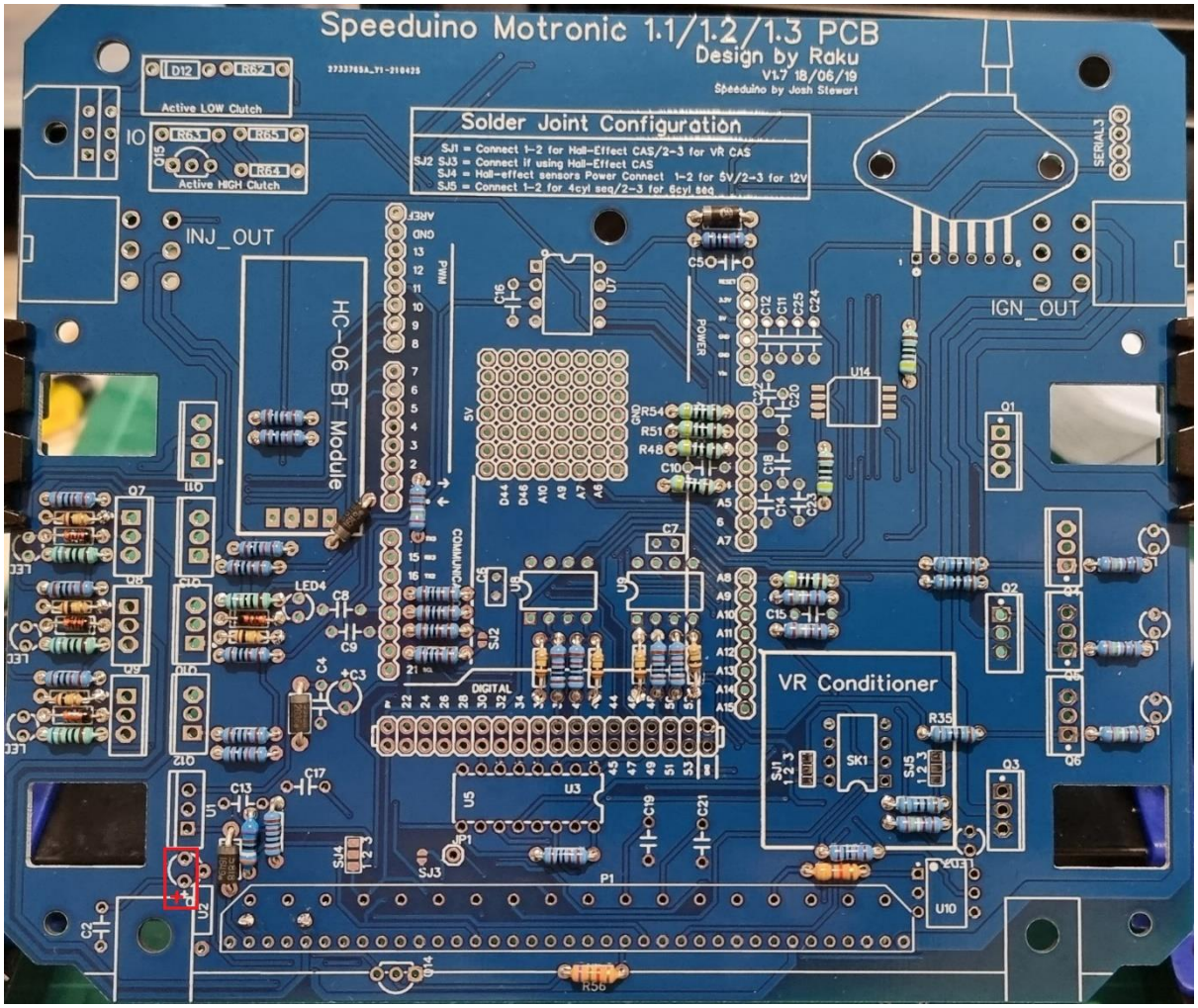
Capacitors



The first capacitor group. Please note this capacitor is polarised and the + leg on the capacitor must be placed into the + side on the board (indicated in red).

Refer to the orientation below:

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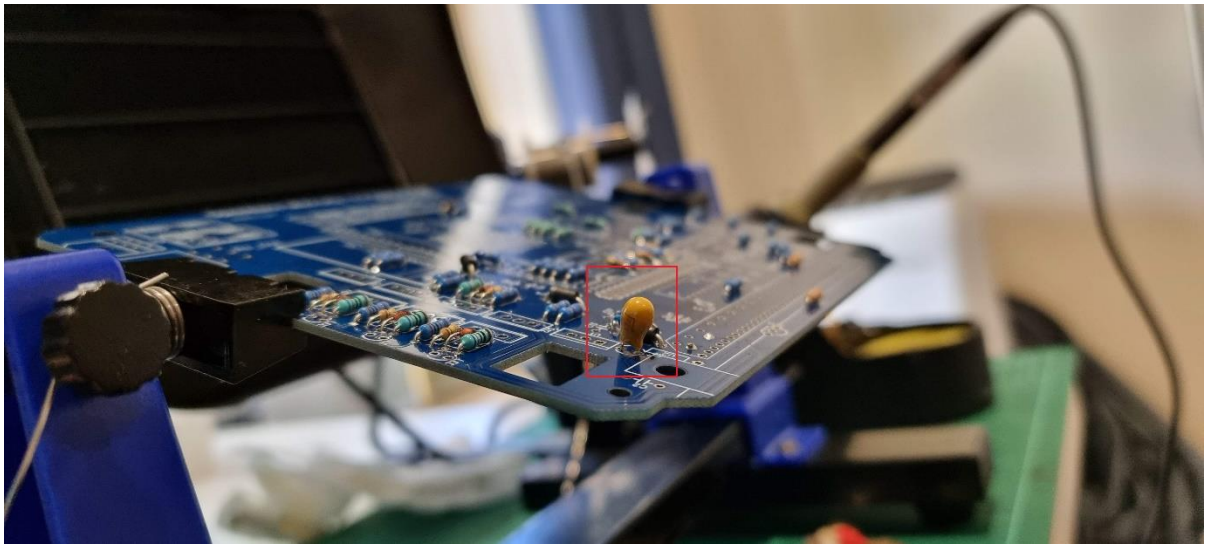

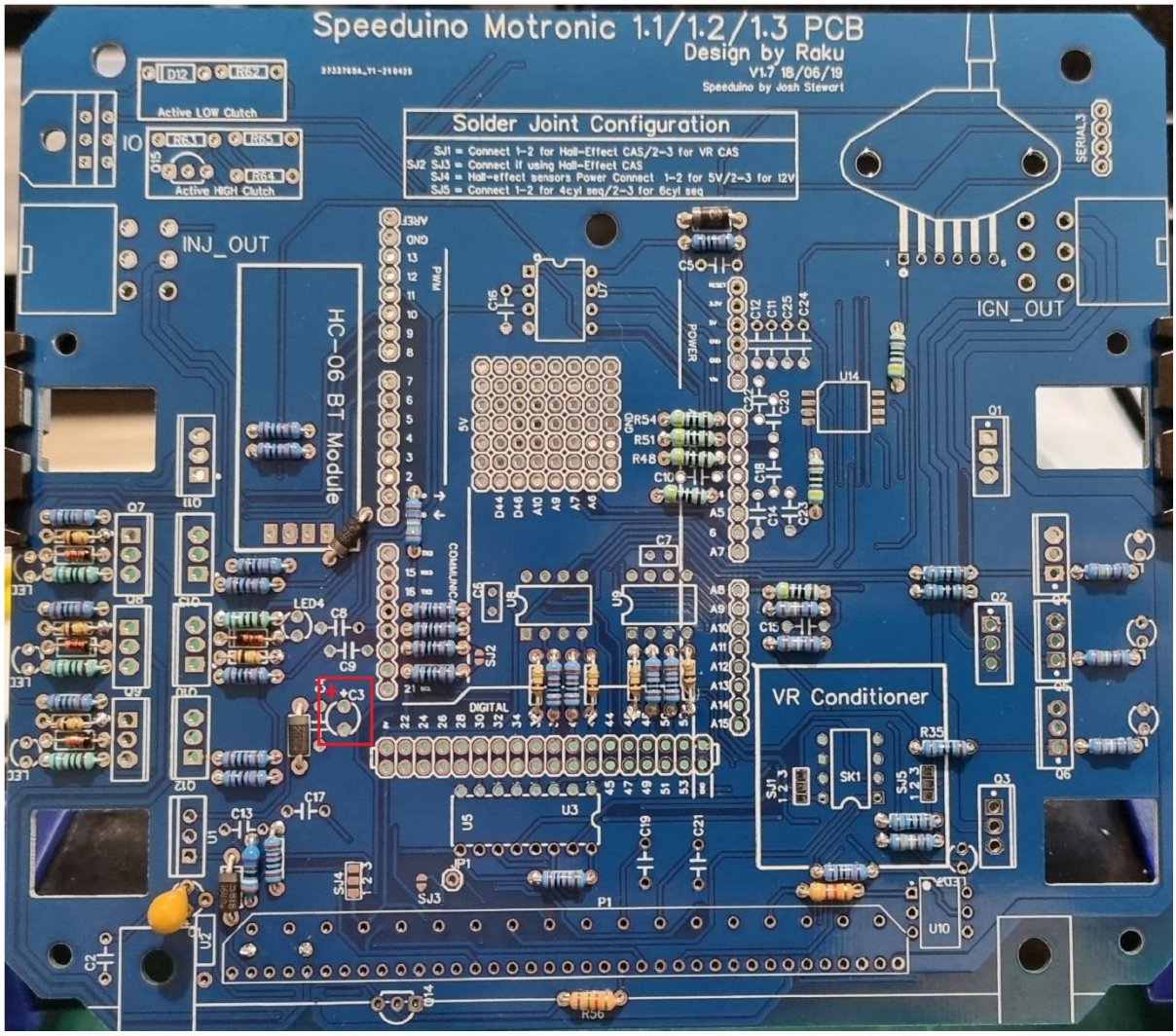

The second capacitor group. Please note this capacitor is polarised and the + leg on the capacitor must be placed into the + side on the board (indicated in red).

Refer to the orientation below:

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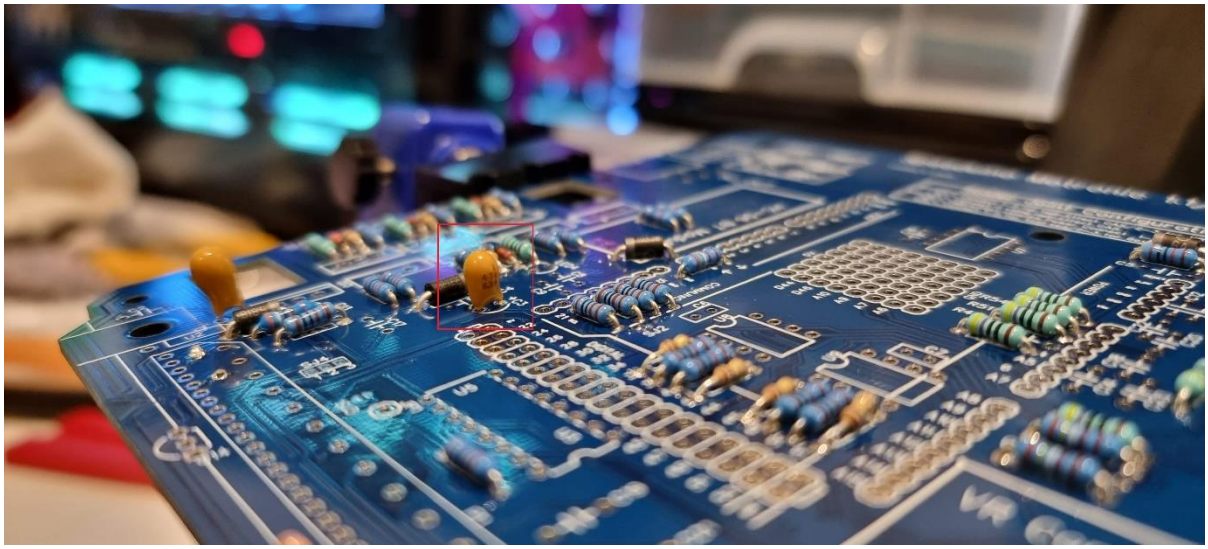

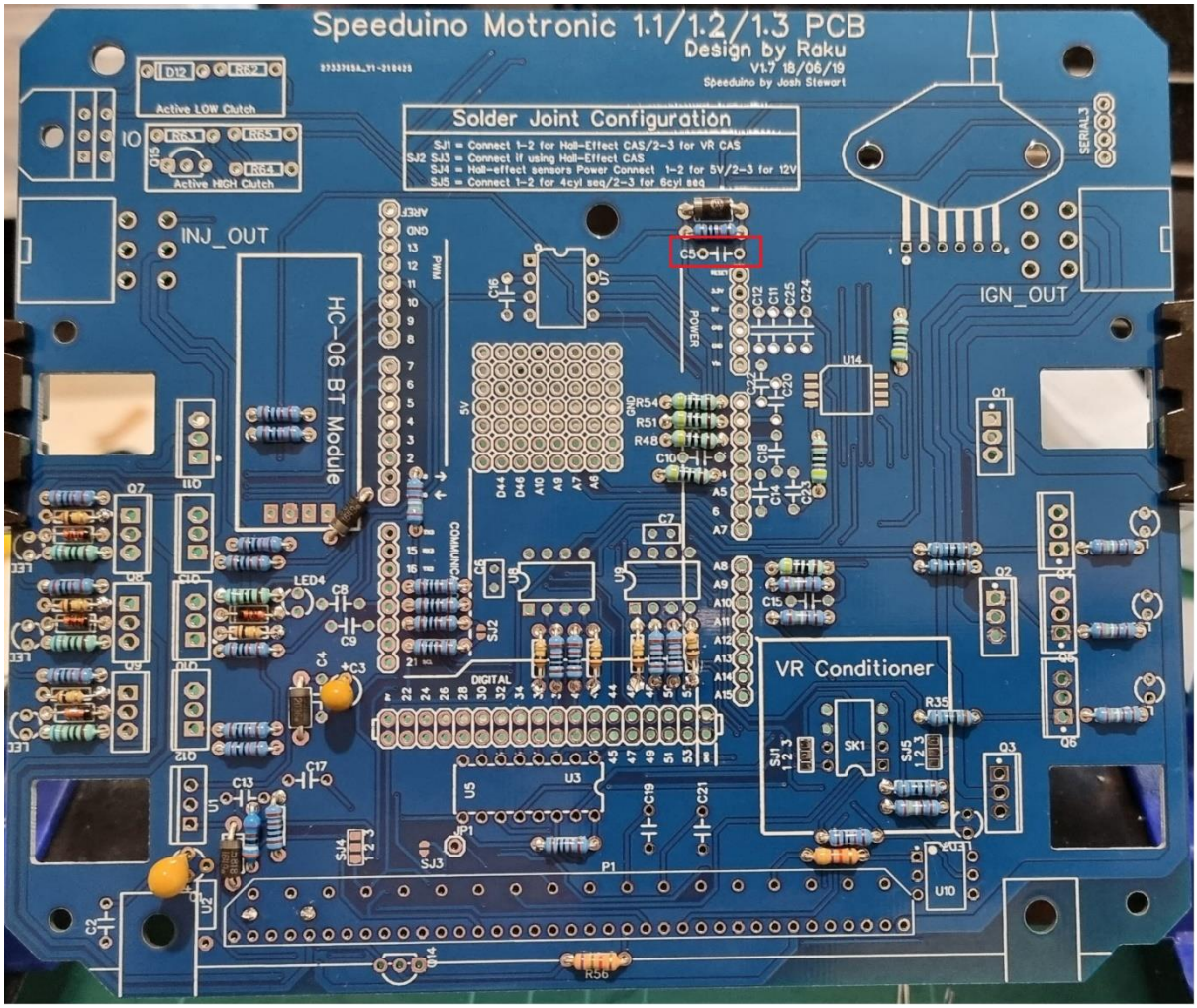

The third capacitor group. This capacitor is not polarised, so orientation is not important.

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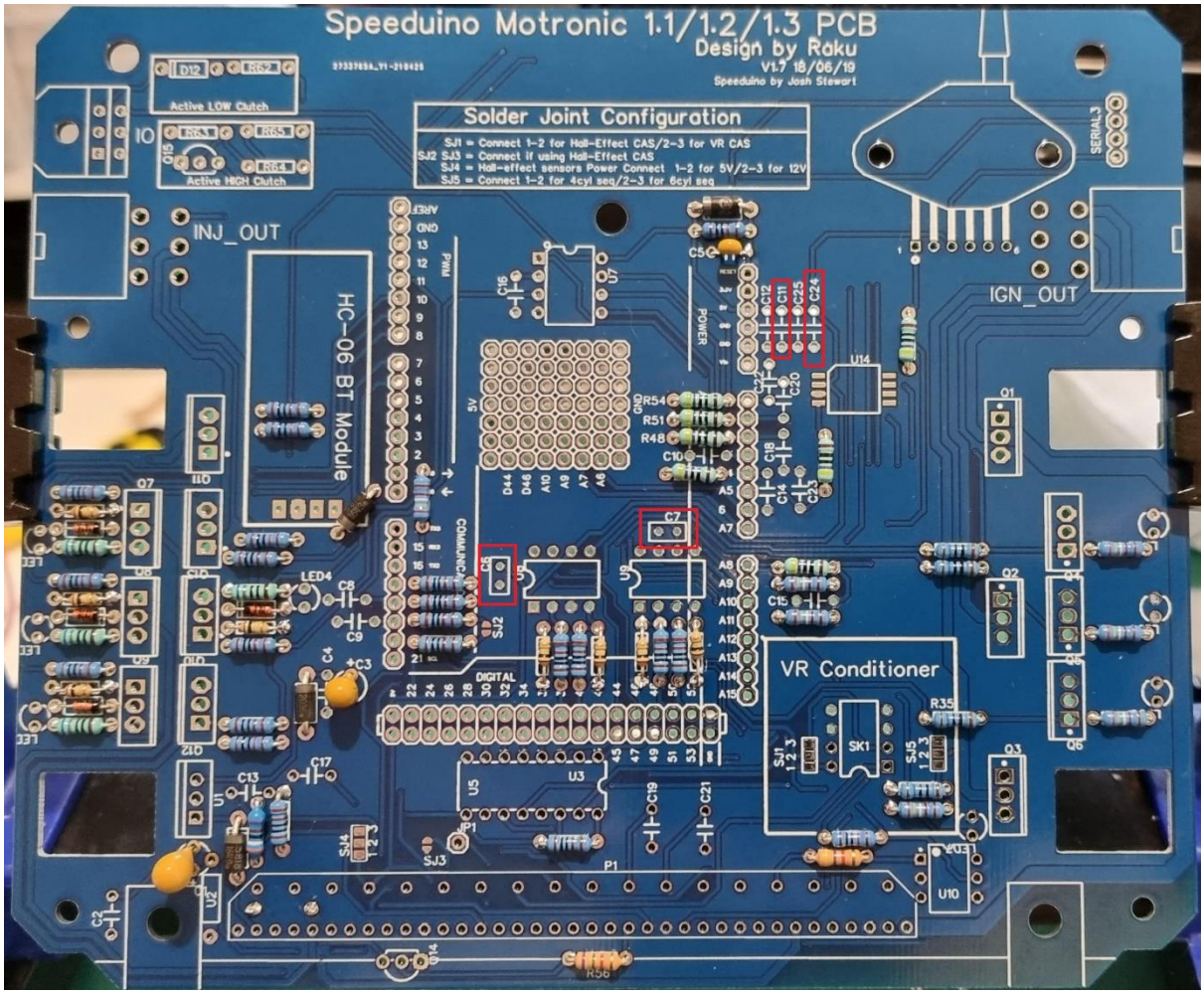

The fourth capacitor group. These capacitors are not polarised, so orientation is not important.

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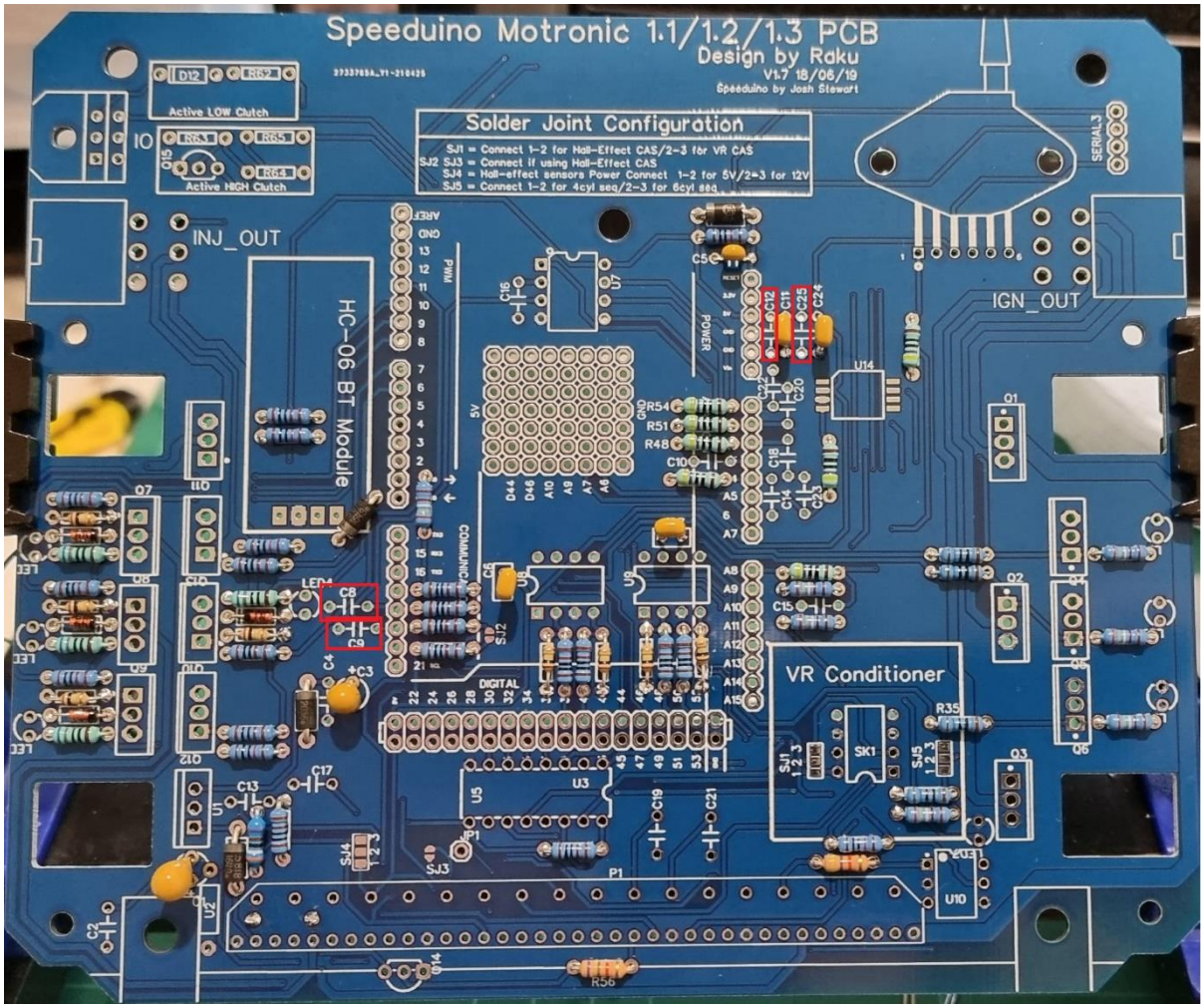

The fifth capacitor group. These capacitors are not polarised, so orientation is not important.

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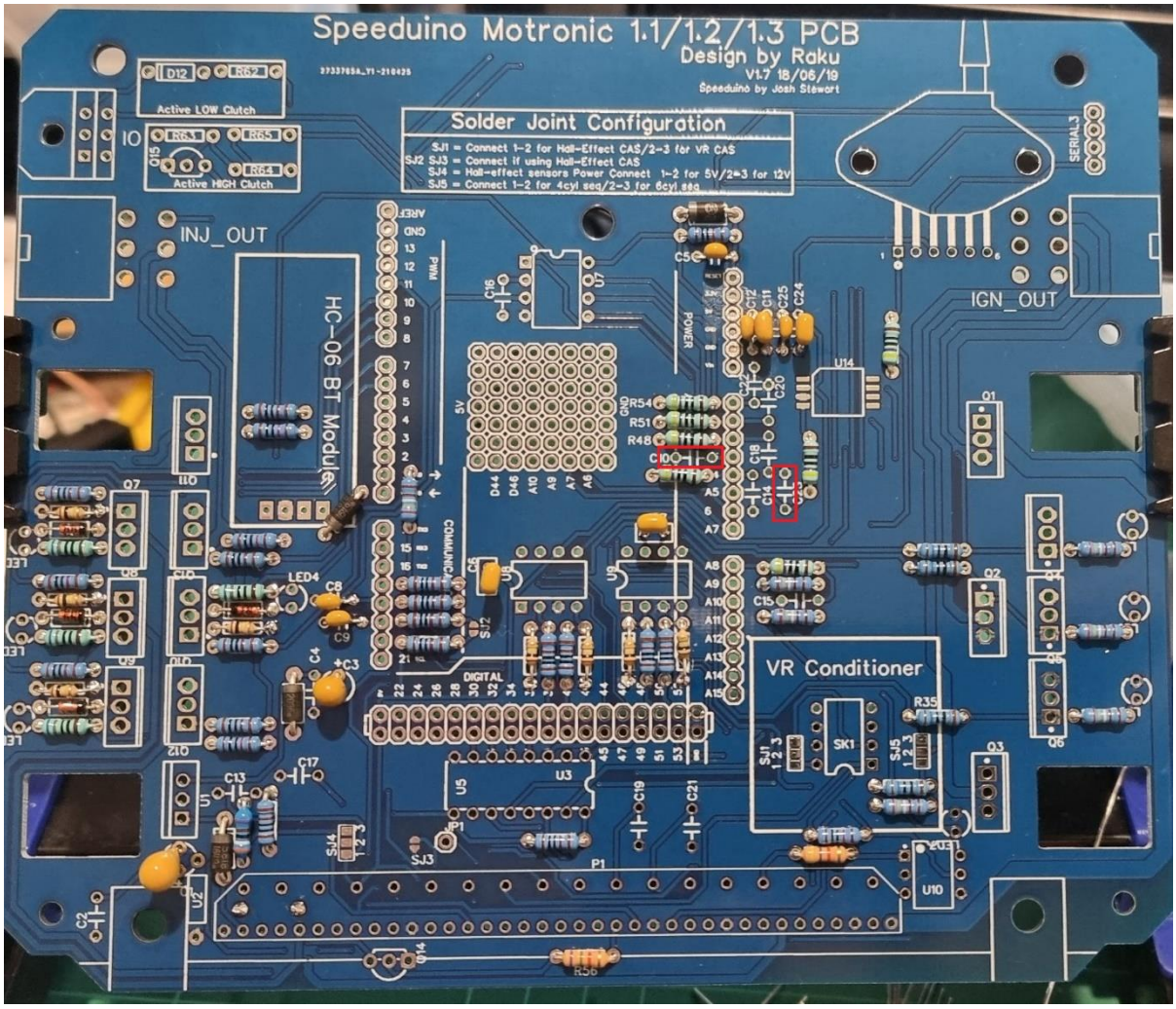

The sixth capacitor group. These capacitors are not polarised, so orientation is not important.

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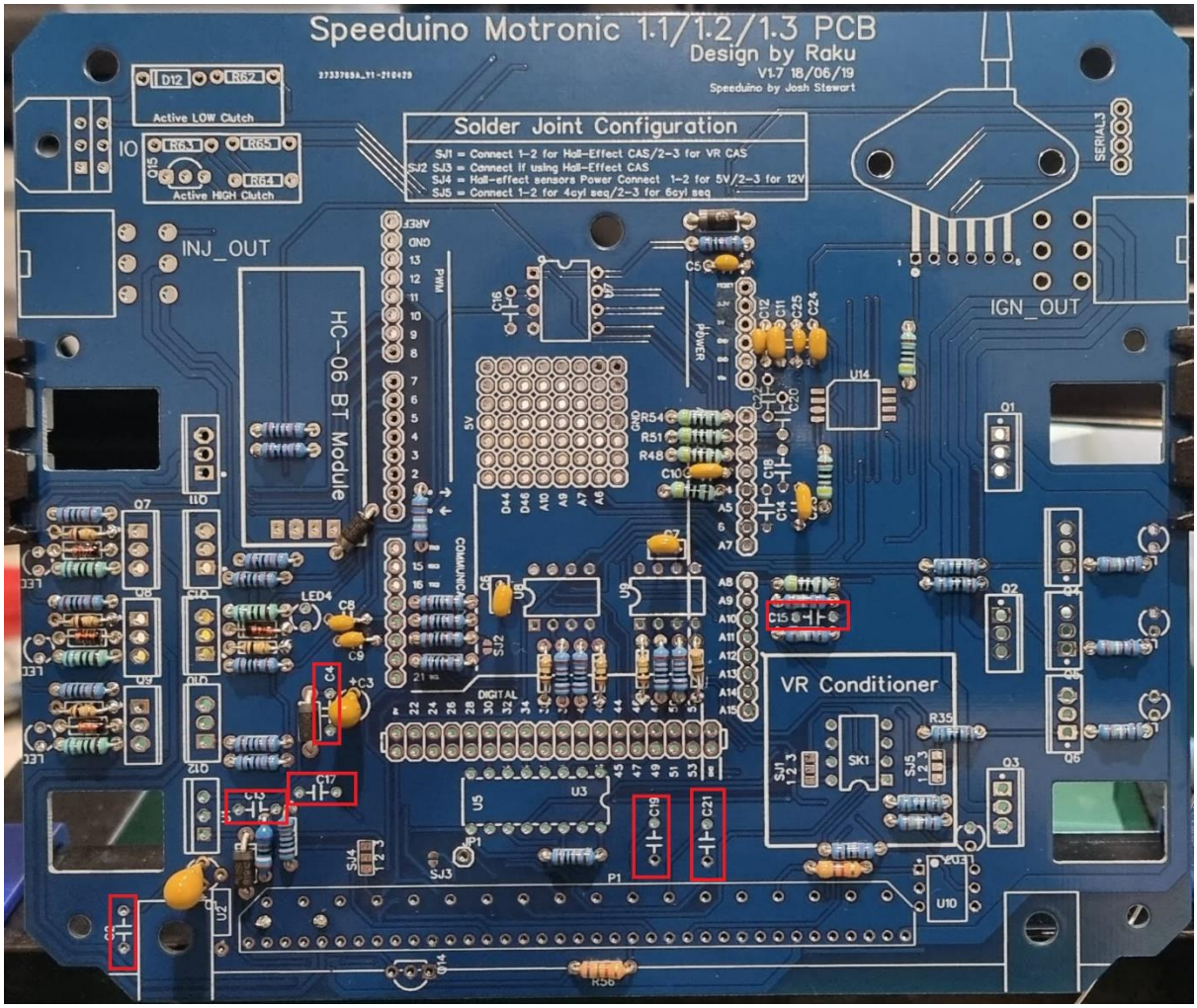

The seventh capacitor group. These capacitors are not polarised, so orientation is not important.

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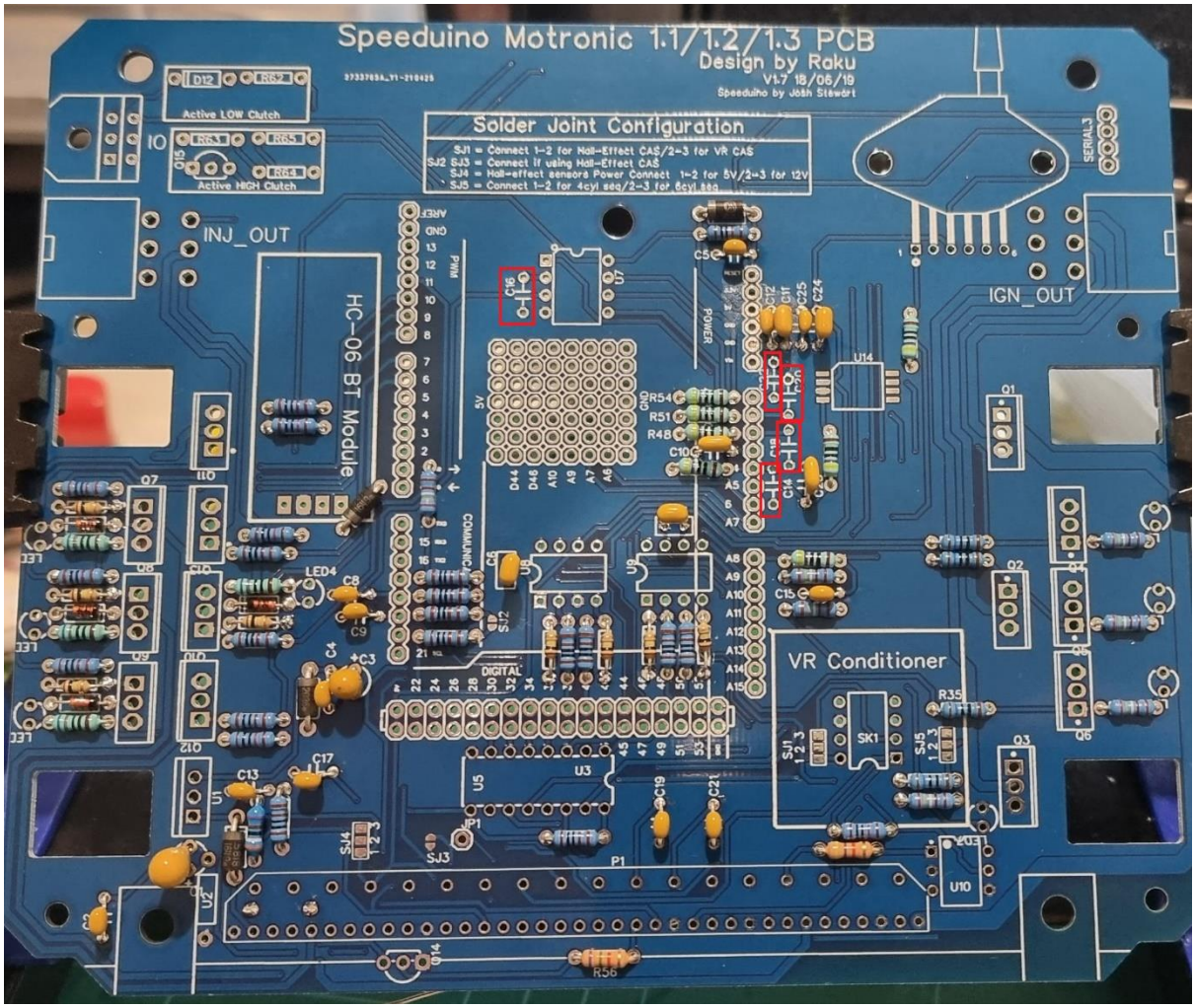

The eighth capacitor group. These capacitors are not polarised, so orientation is not important.

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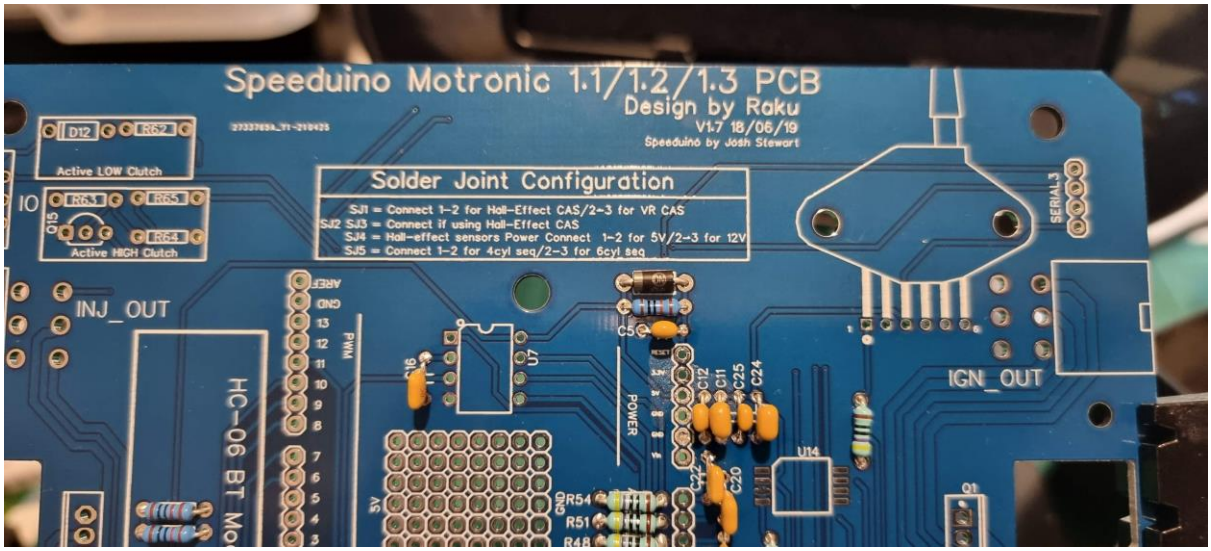
Solder Joint Configuration



Take note of this solder joint configuration.

It translates as follows:

SJ1	Connect 1-2 for Hall Effect CAS (Crank Angle Sensor) OR 2-3 for VR CAS (stock on all motronic 1.3 engines)
SJ2	Connect if using Hall Effect CAS
SJ3	Connect if using Hall Effect CAS
SJ4	If using Hall Effect sensor, connect 1-2 for 5v power or 2-3 for 12v power
SJ5	Connect 1-2 for 4 cylinder sequential or 2-3 for 6 cylinder semi-sequential (requires a camshaft position sensor for 4 cyl sequential)

With that in mind, this guide will cover installation for a standard Motronic 1.3 setup.

In which case, SJ1 needs pins 2-3 jumpered and is the only jumper required.

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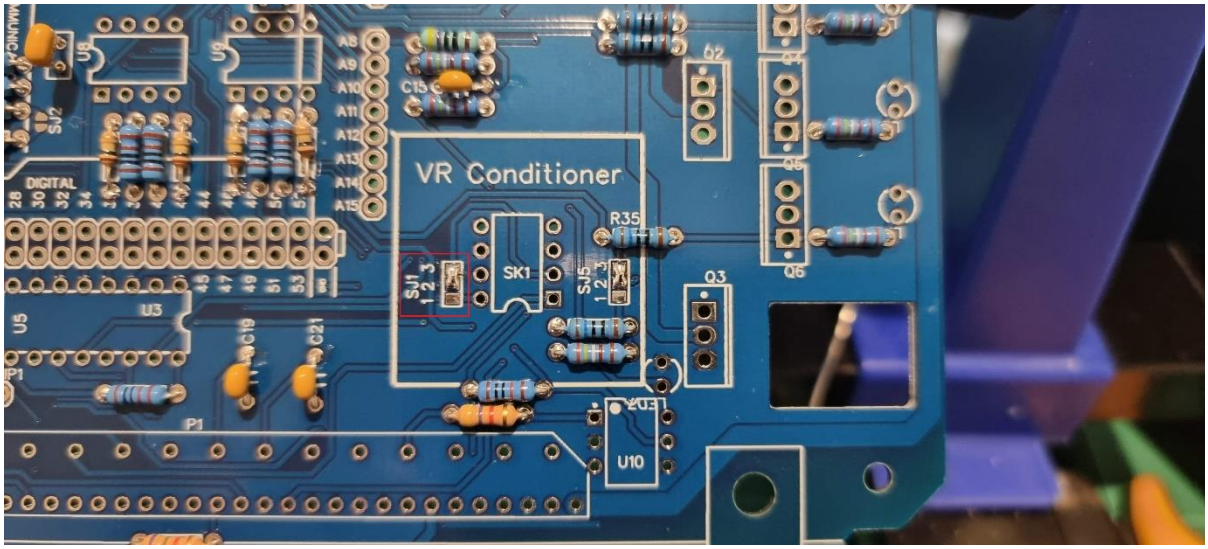

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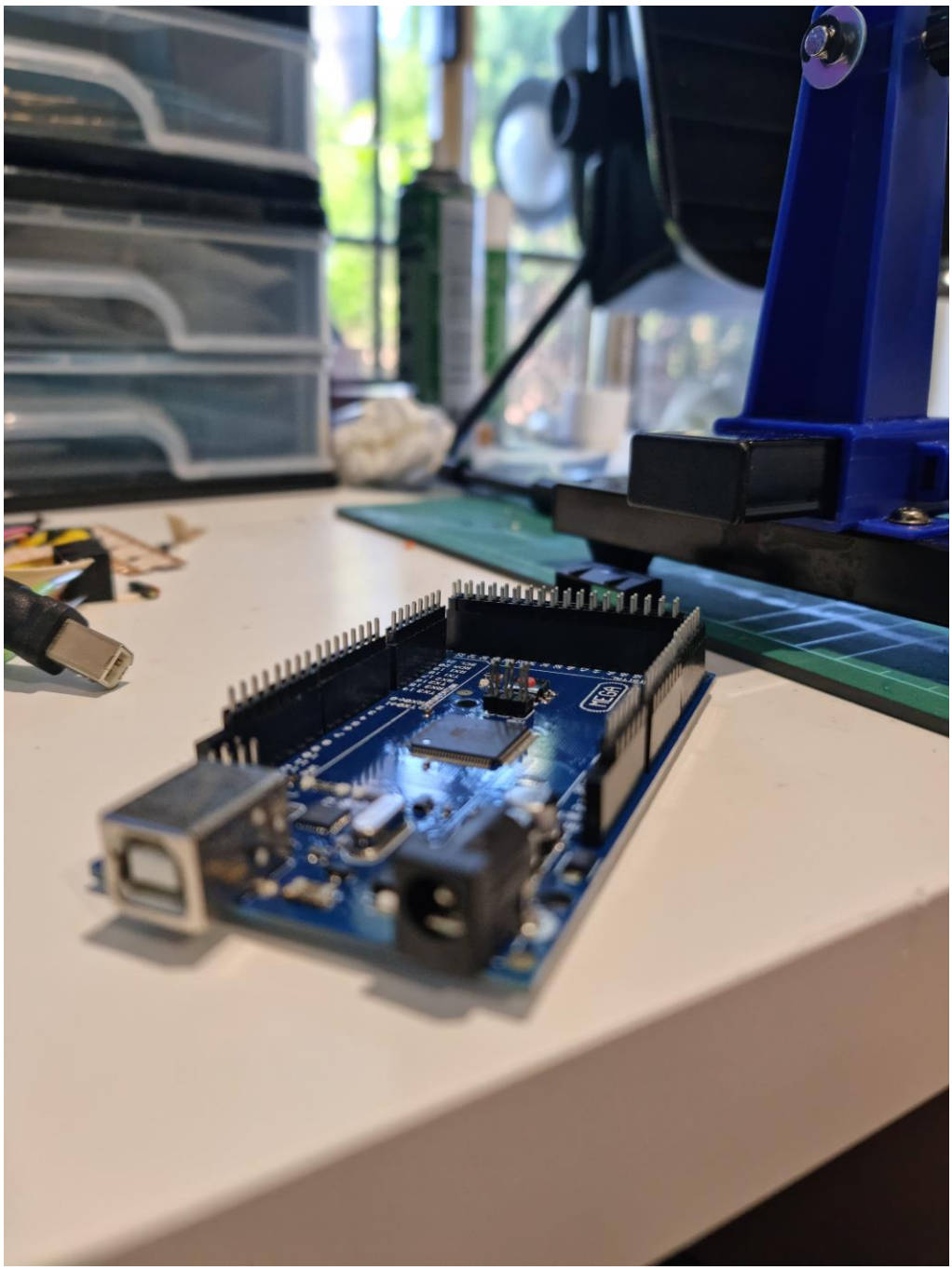
Header Pins

Next we will cover the installation of the header pins required for your controller board.

Firstly, cut the header pins to their required size based on the holes on the board. Then plug them into the controller board.



Now insert the controller board into the main ECU board, and solder the header pins on the underside of the main ECU board. While working on this, you can also install the header pins for SERIAL3 and JP1 (shown in red)

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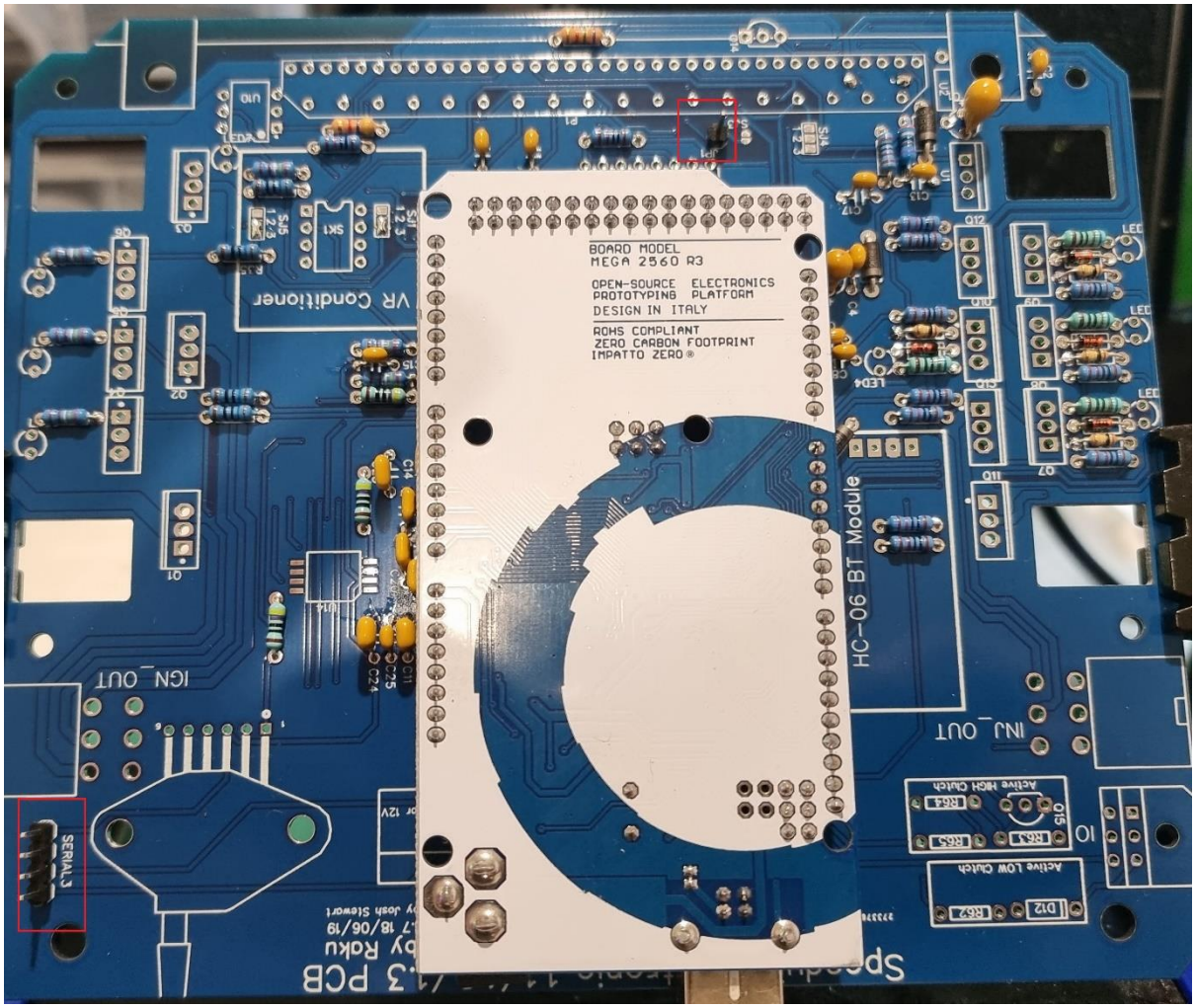

Once you've soldered the pins on, remove the controller board.

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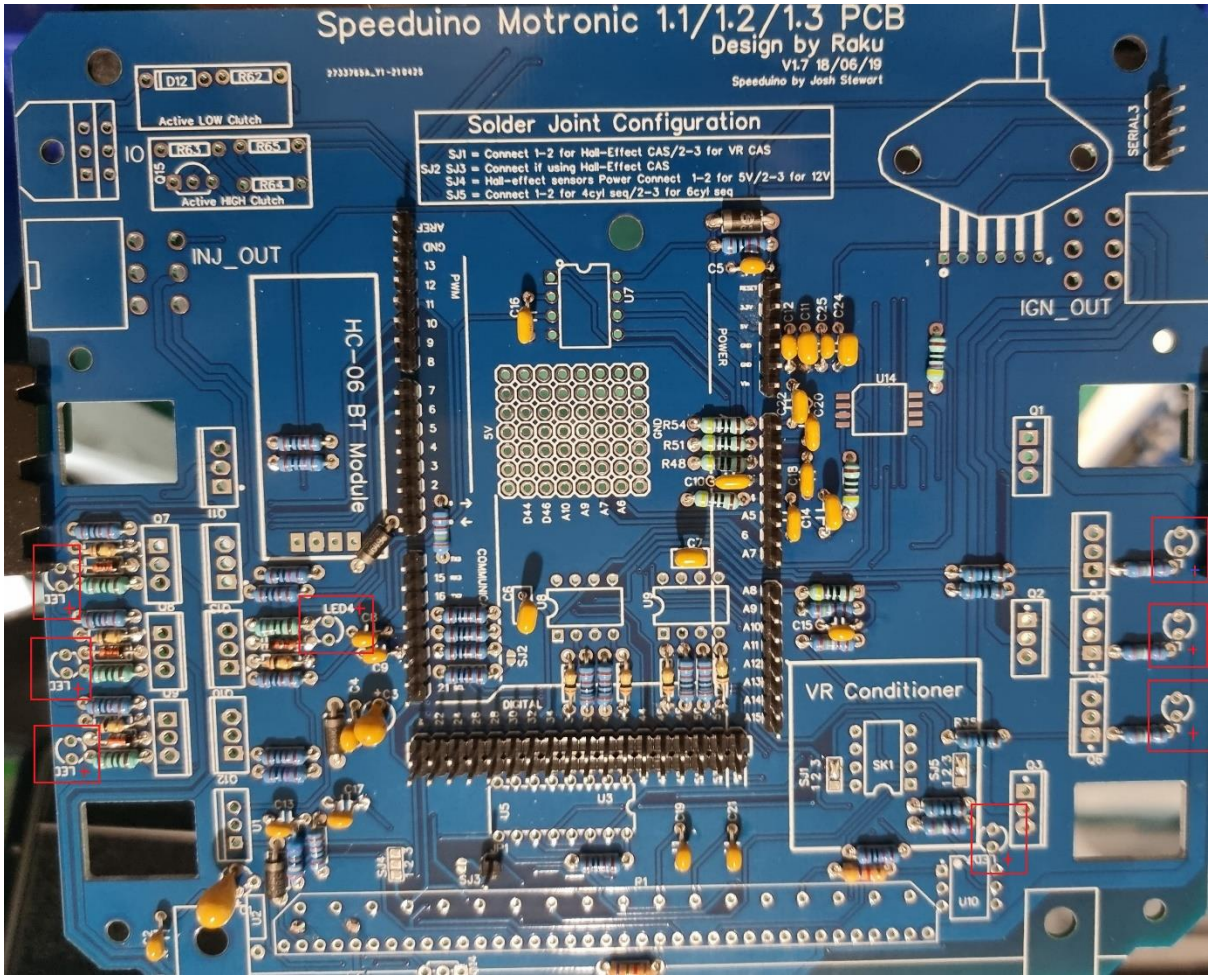
LED’s



Now we will install our indicator LED’s. The long leg of the LED goes into the hole closest to the “LED” label on the silkscreen. Refer to the image above for the orientation.

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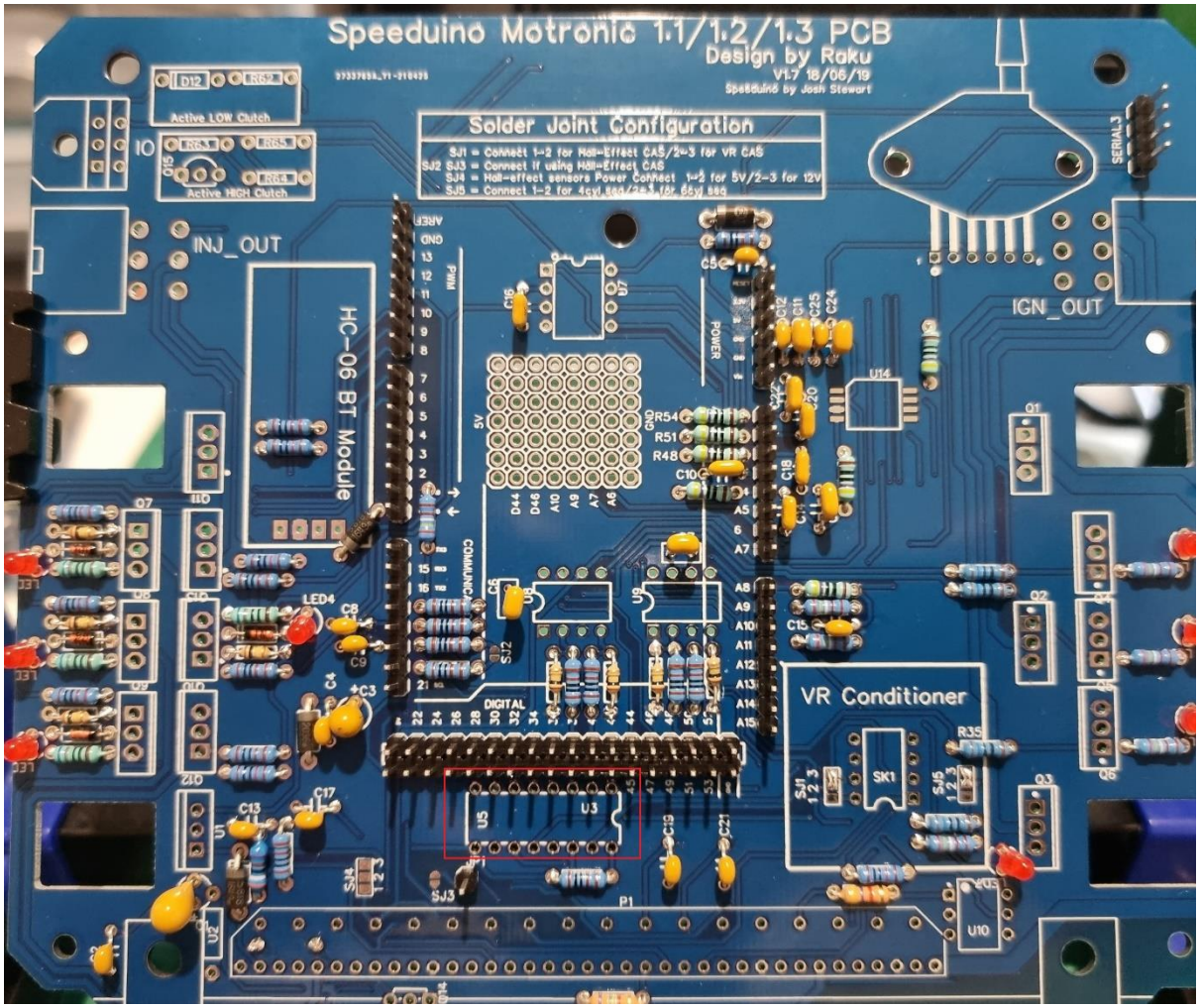
IC’s, Transistors and MOSFET’s



Now we will cover the installation of the IC’s for the board.
Firstly, let’s install U5 (ULN2003). The notch on the chip should match the notch on the silkscreen as shown below.

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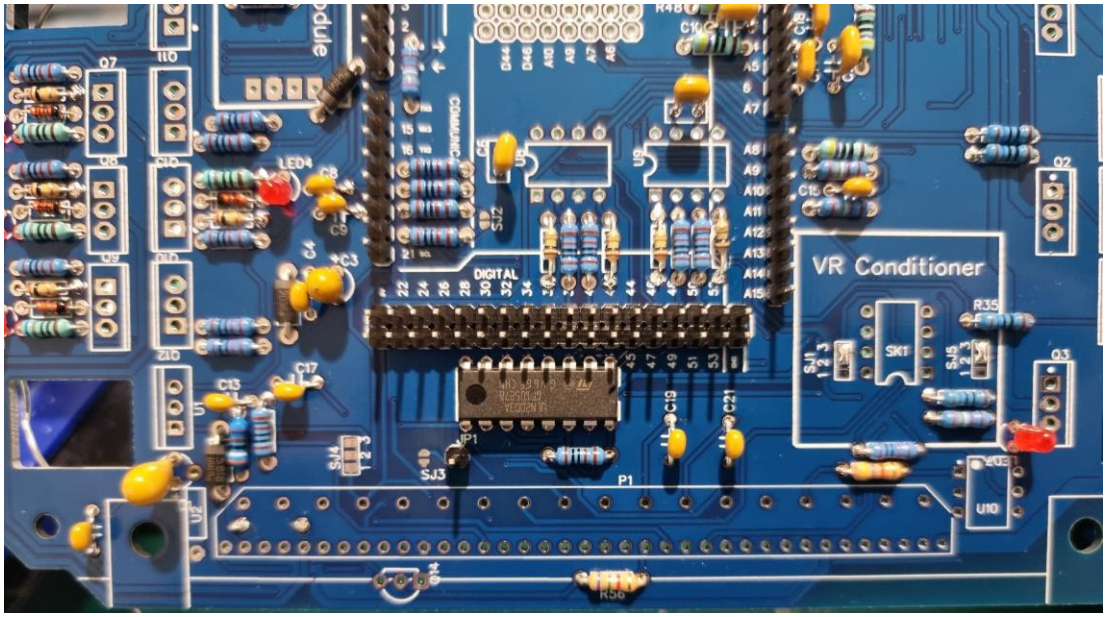

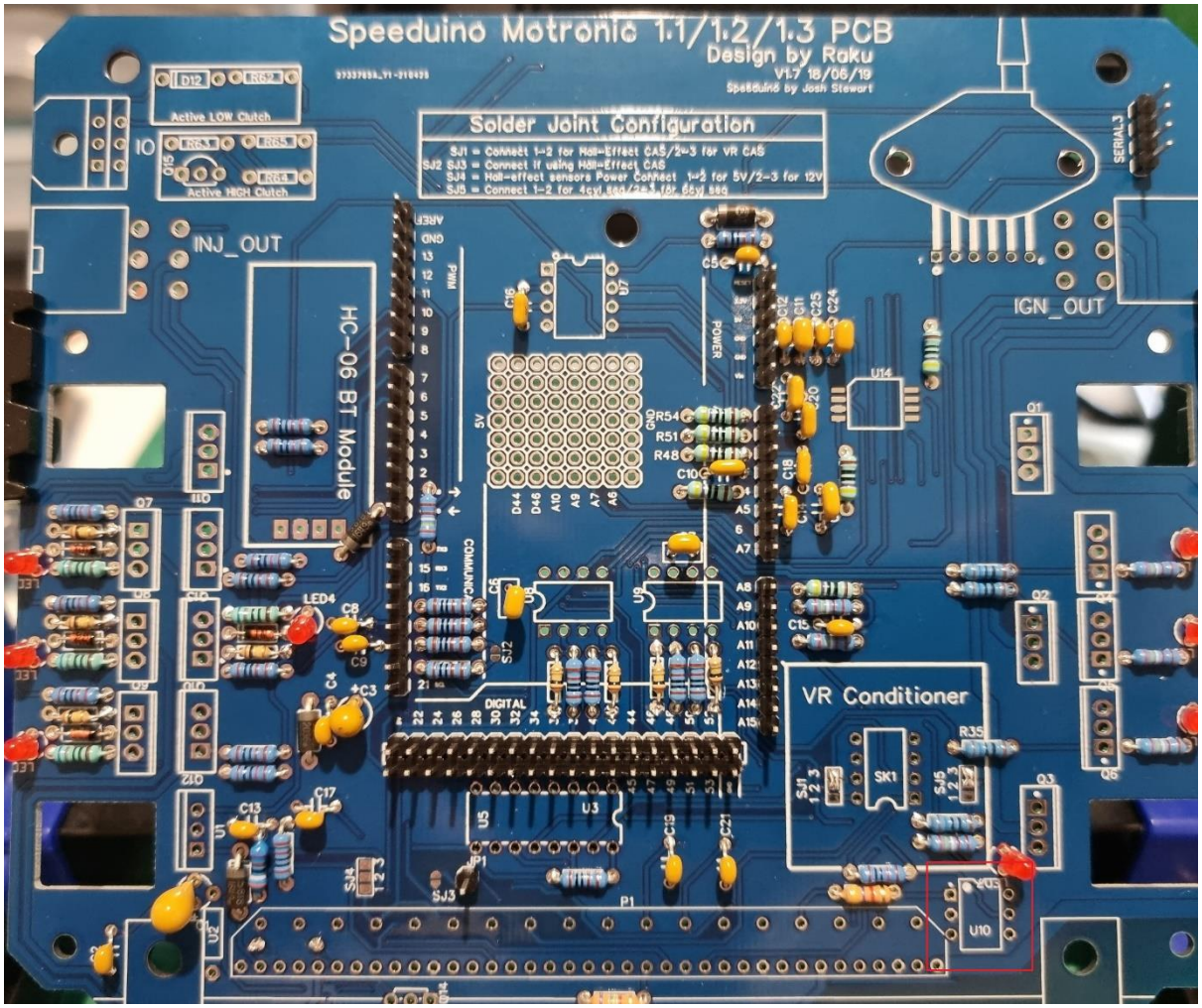

Now we will install U10 (4N35). The chip will have a dot on one corner, match the dot to the dot on the silkscreen as shown below.

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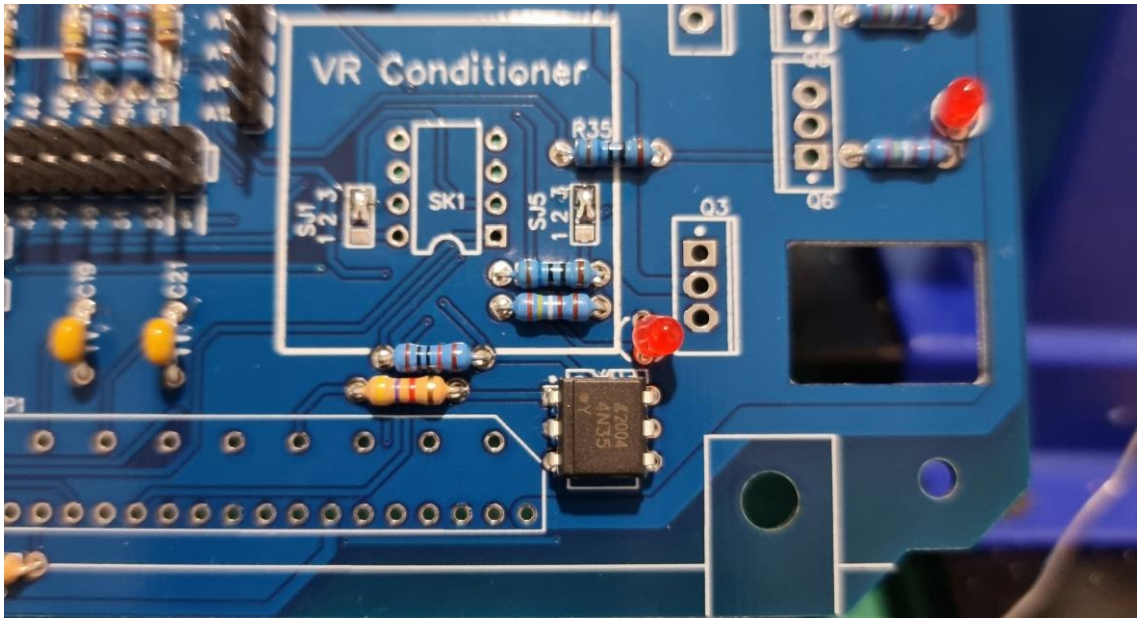

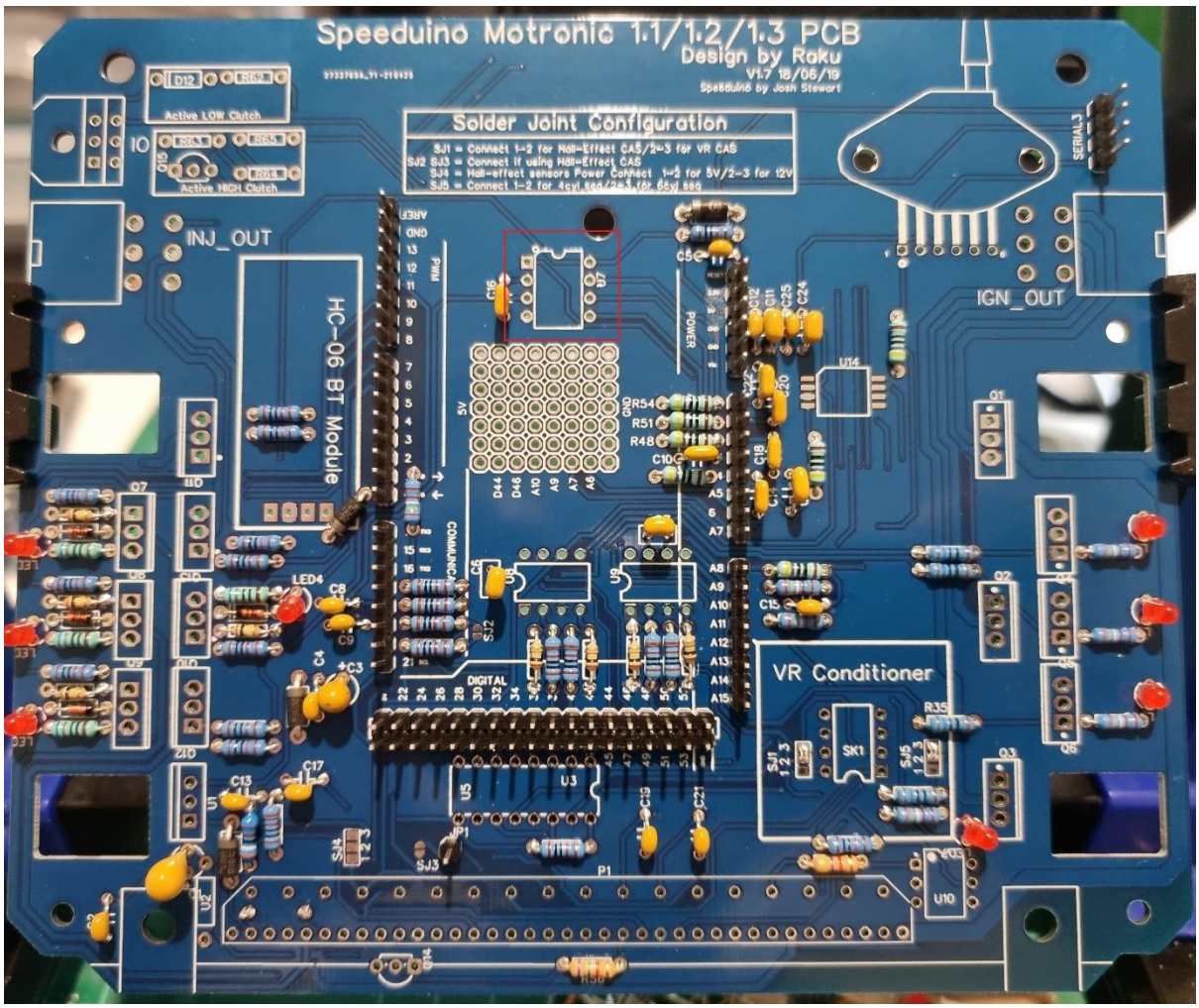

Next up is U7 (SP721APP). Like U5, this has a notch that needs to match the notch on the silkscreen as shown below.

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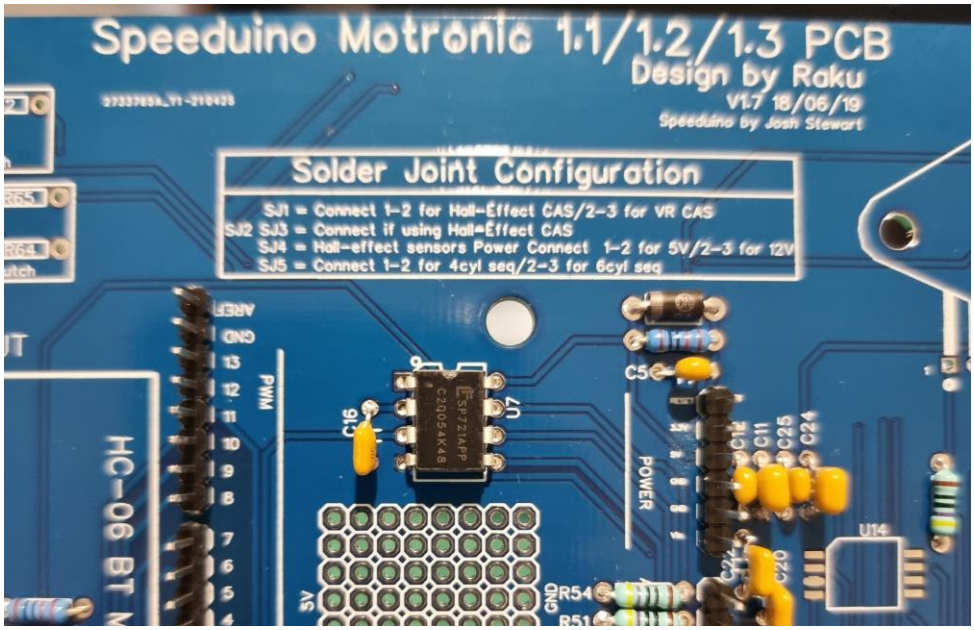

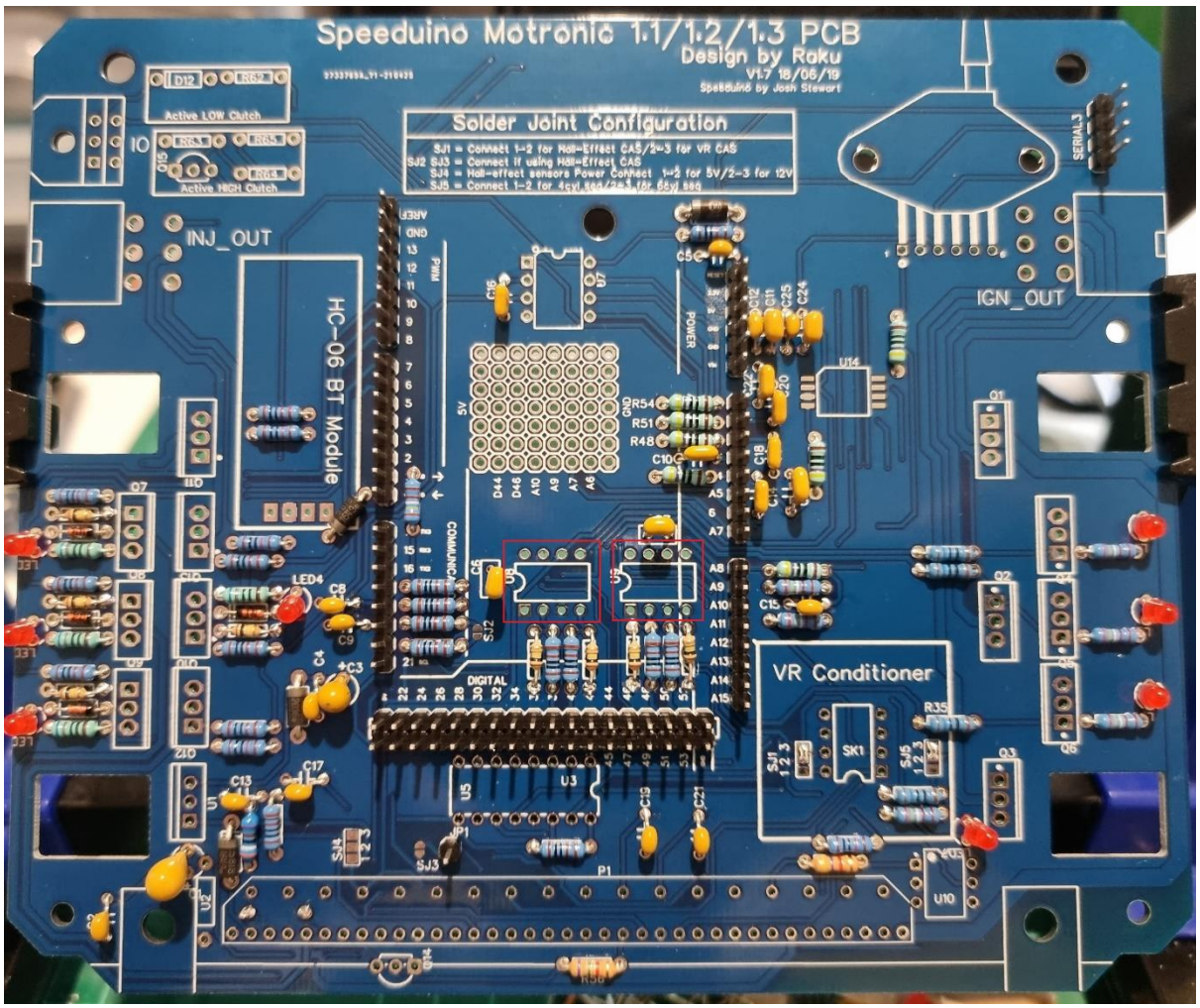

Next up are U8 and U9 (TC4424). Match the notches on the chips to the notches on the silkscreen as

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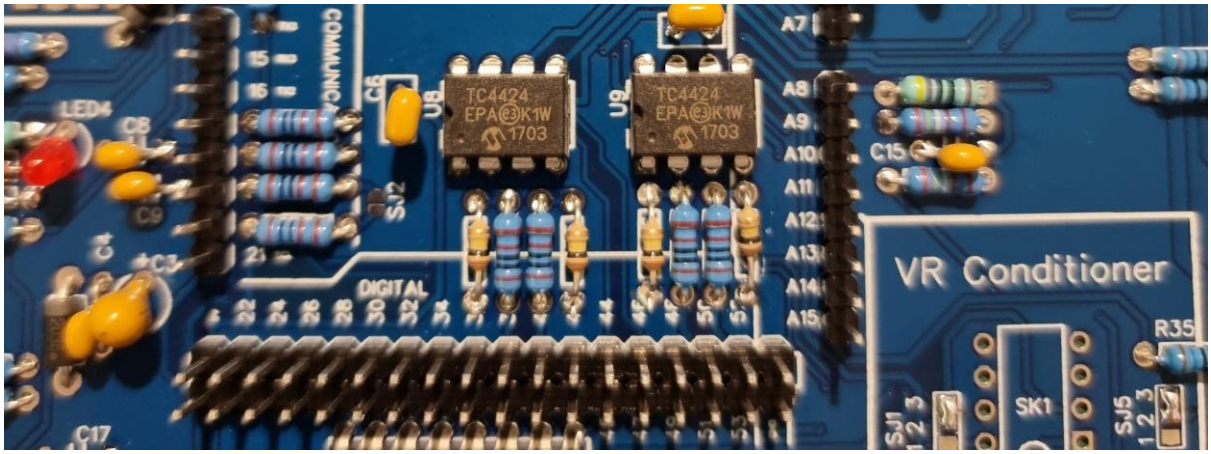
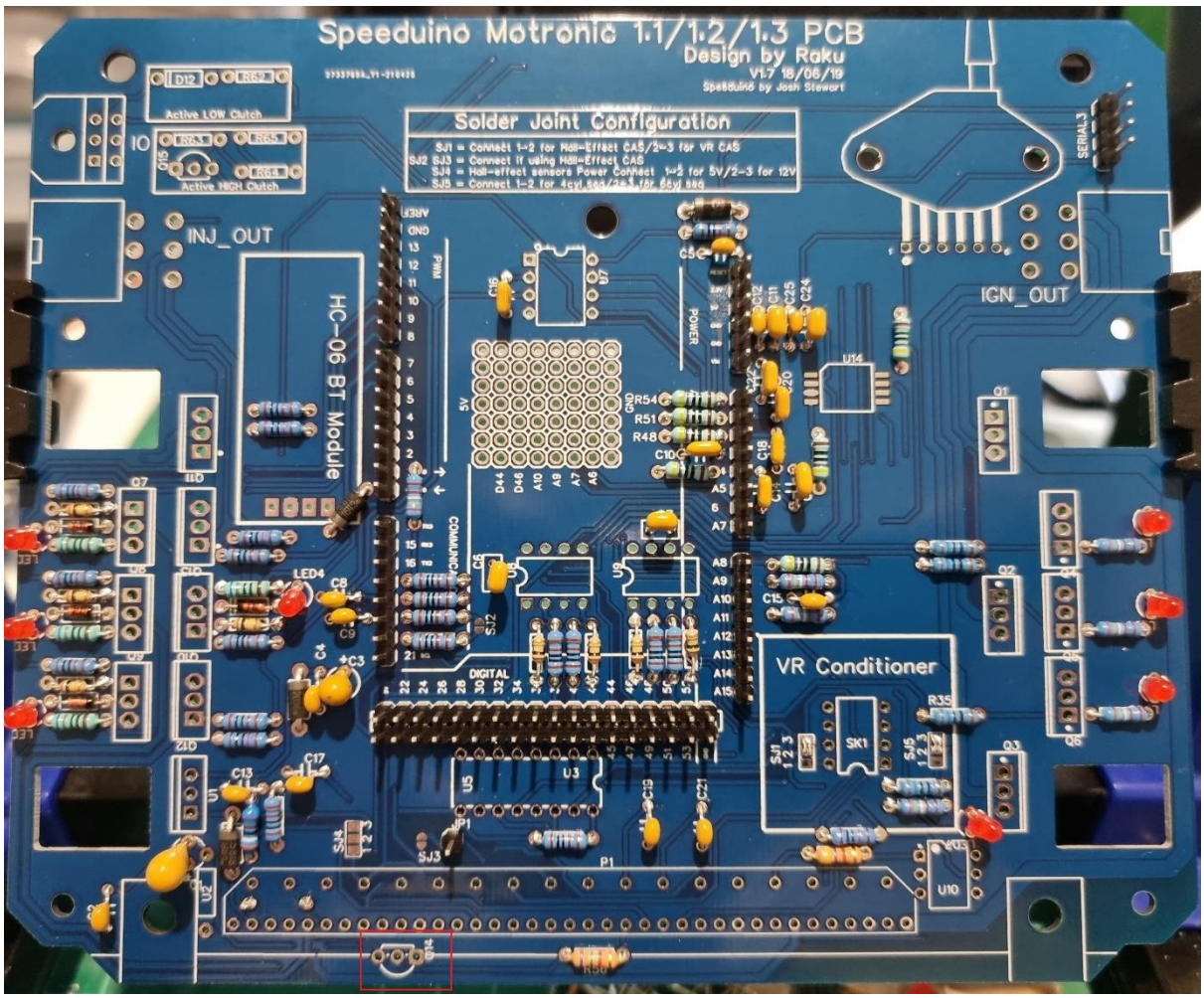
shown below.





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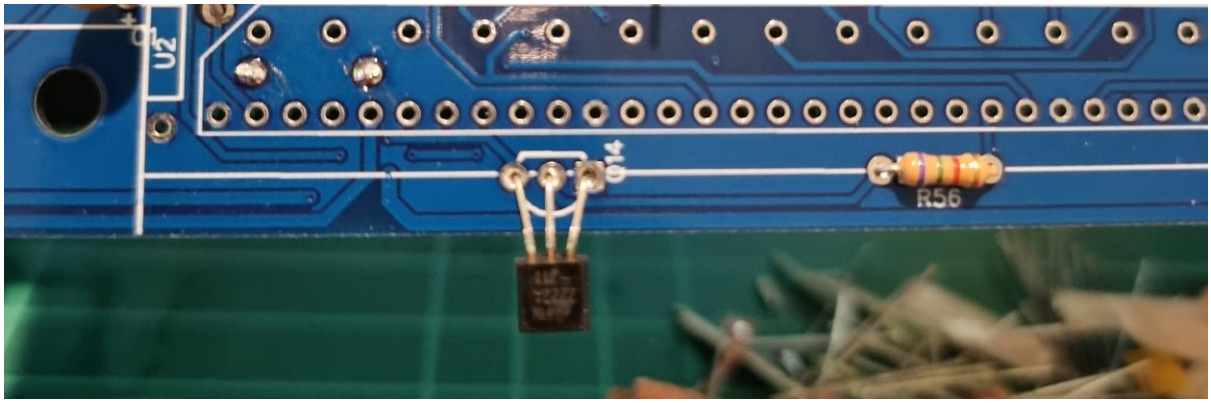
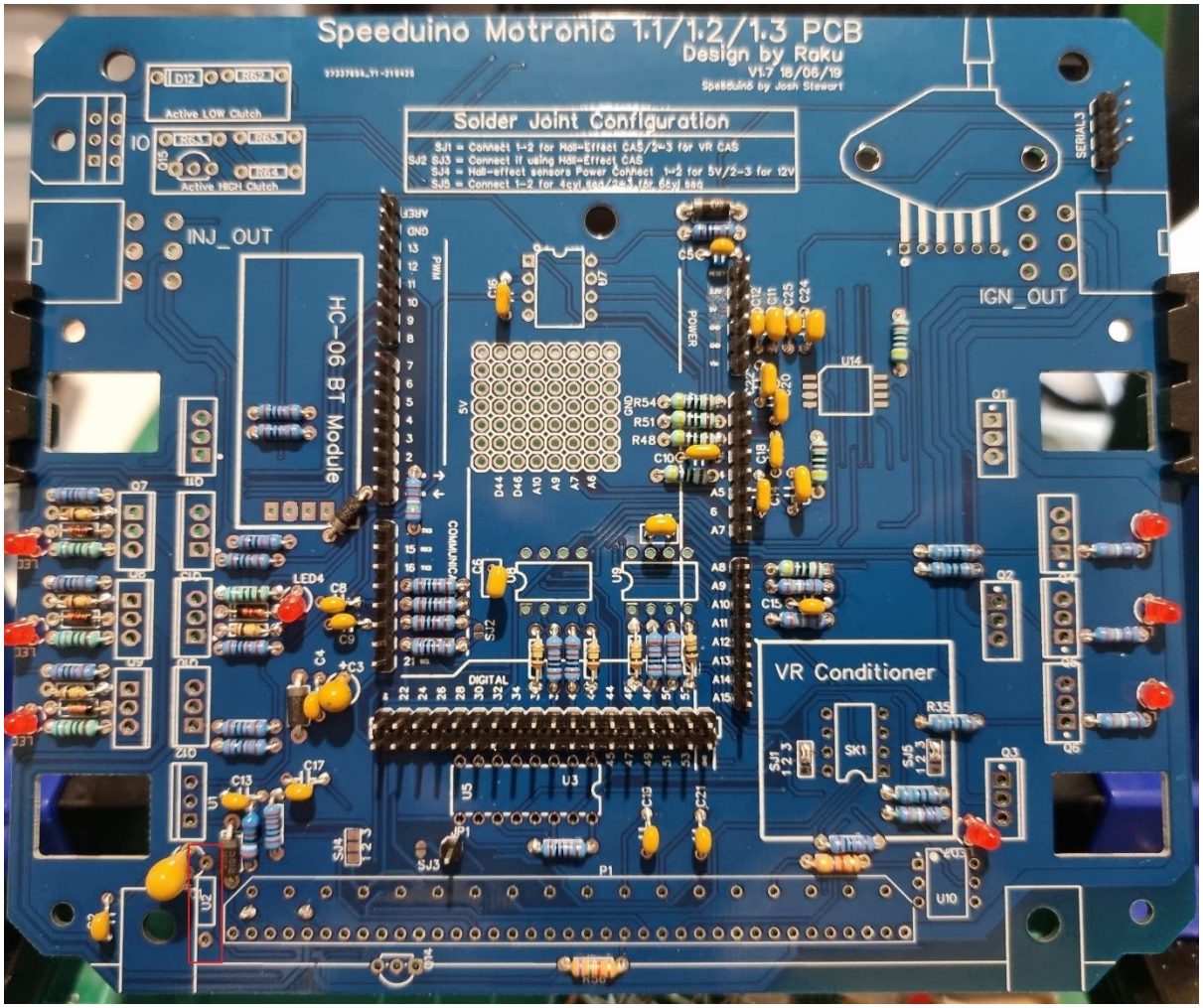
Now we will install Q14. The shape of the silkscreen matches the shape of the transistor which you can use for orientation. This can either be installed on the top or bottom side of the board, but will need to be bent 90 degrees to accommodate the ECU connector as shown below.





Next, install U2. This does not have any orientation.

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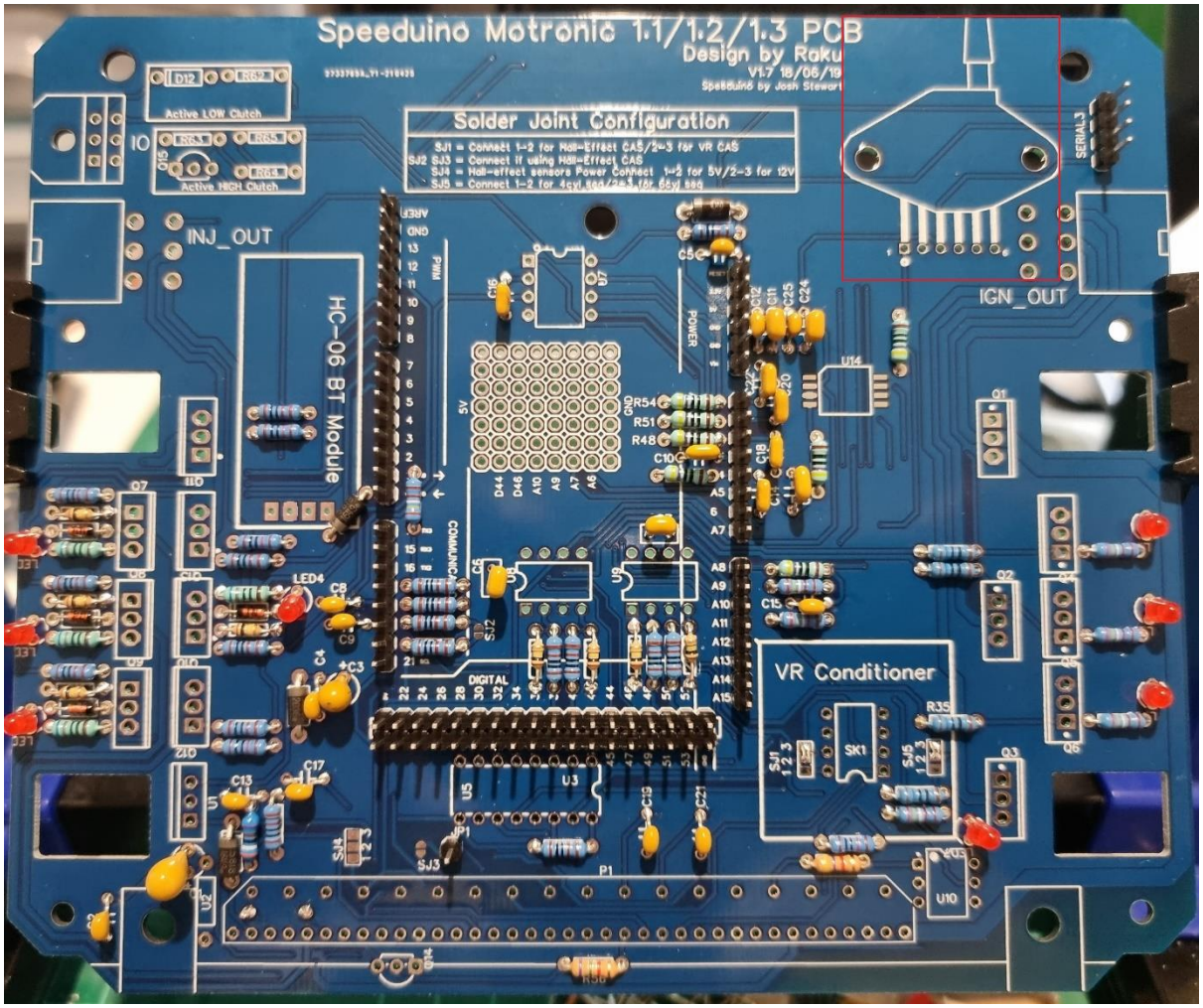
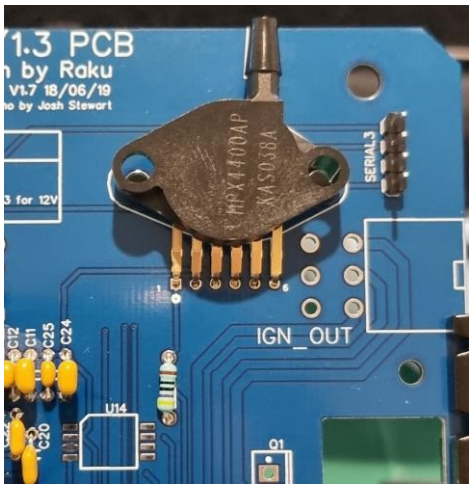


Now we will install the MAP sensor. This should be inserted as far as the legs can be gently pushed in and bent down to match the mounting holes. Then, using the nylon hardware provided, secure the MAP sensor to the board. To make soldering easier and cleaner, you can now trim the legs on the underside of the board.



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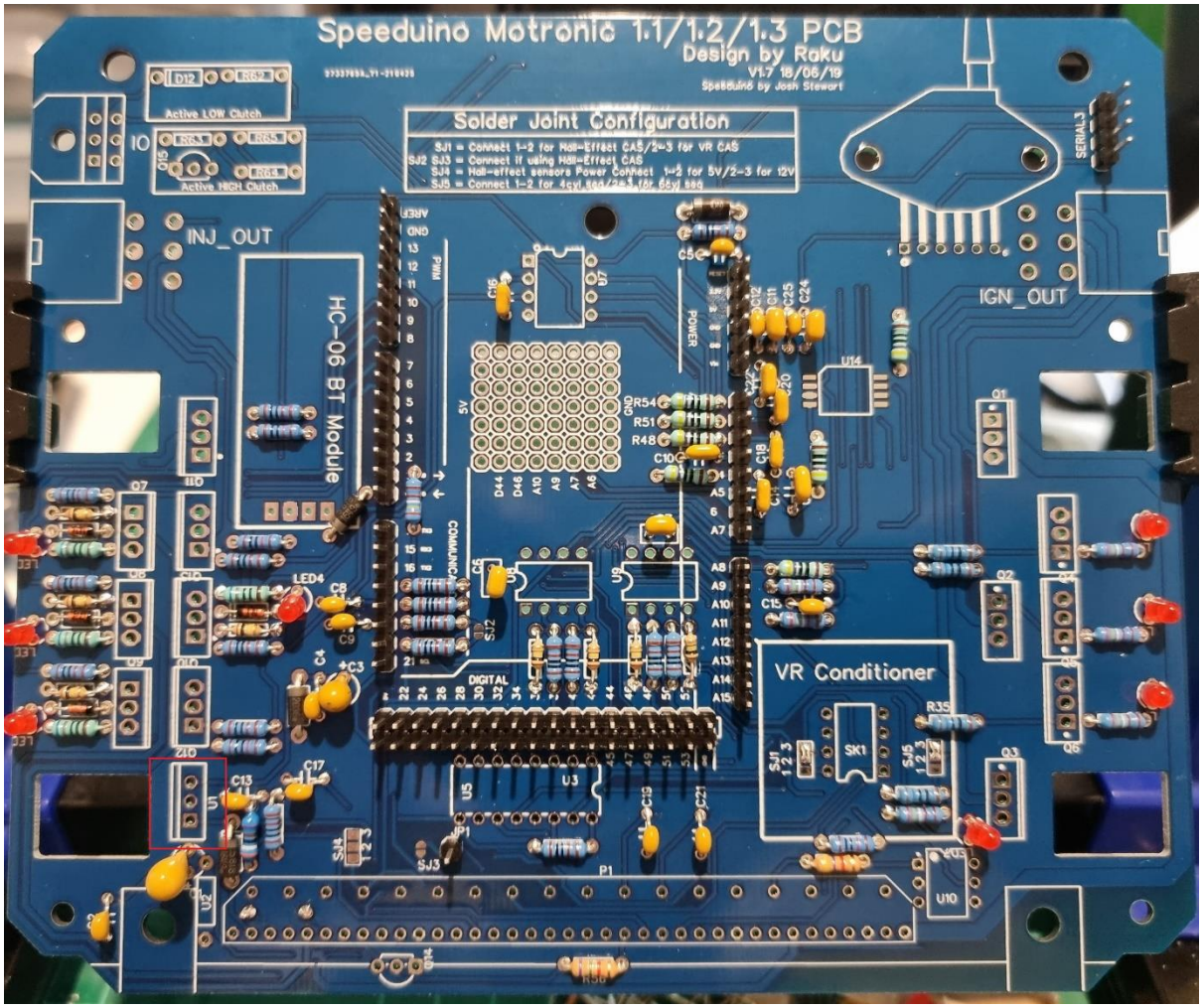
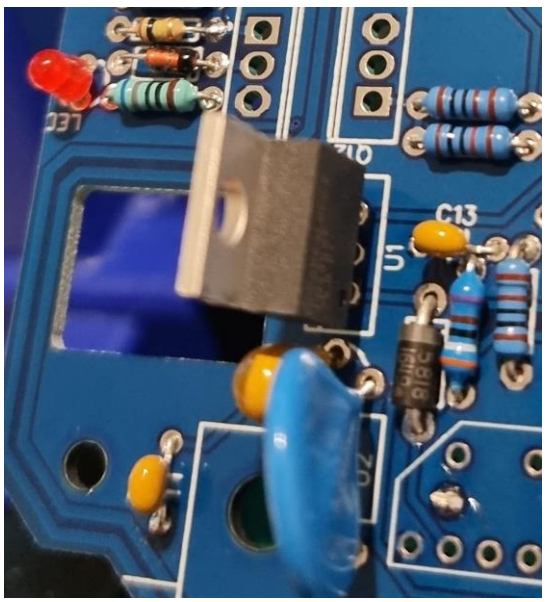


Next, install U1 (LM2940). The silkscreen has an additional notch on one side to indicate where the metal/mounting hole side should face. Refer to the image below for the orientation. Note that U1 won't go all the way through the board.



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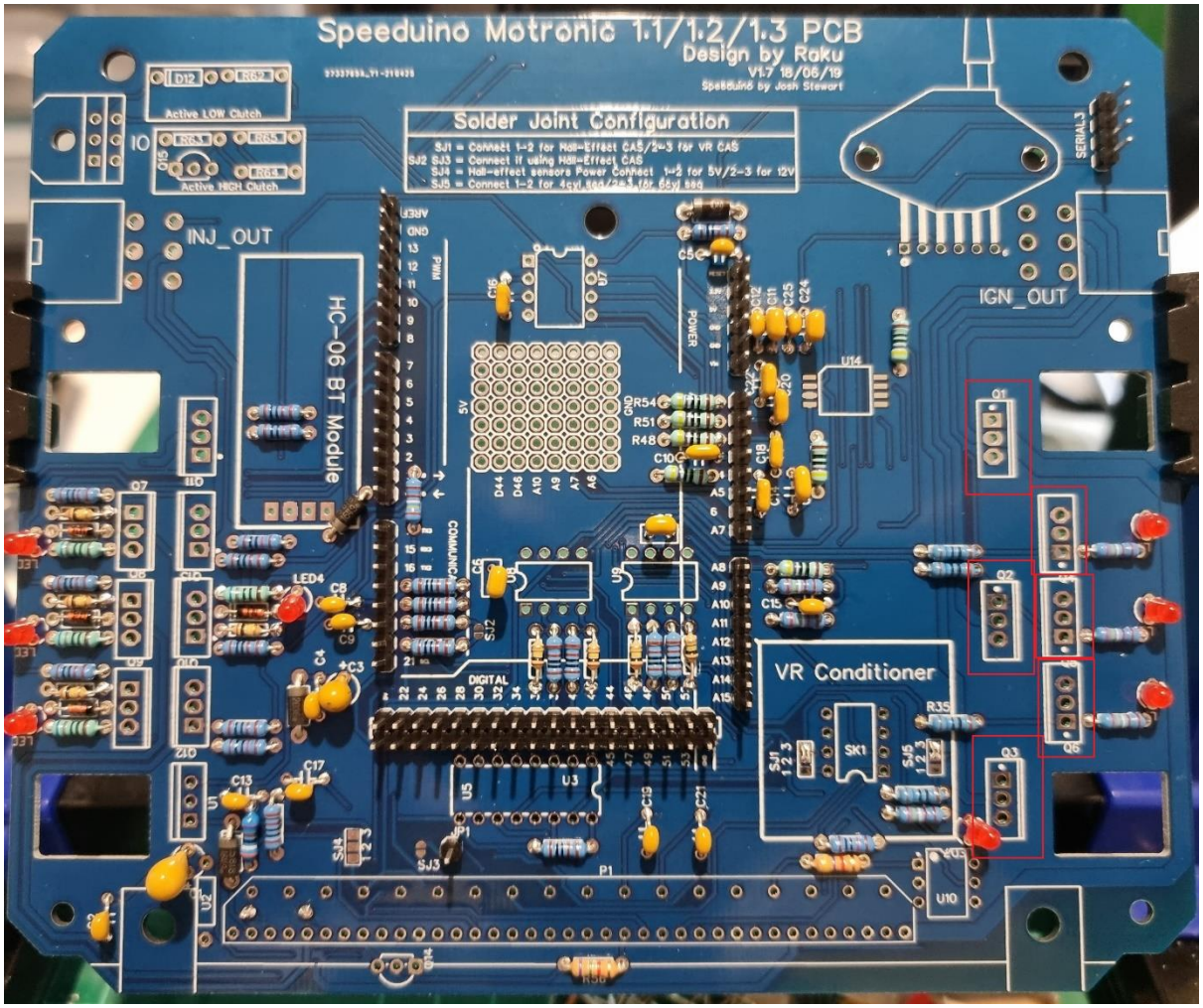
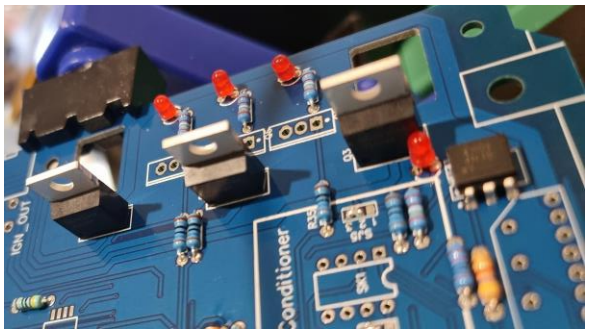


Next we will install the ignition MOSFETs. Like U1, the silkscreen has an additional notch on one side to indicate where the metal/mounting hole side should face. These chips should be gently pushed in all the way. Please refer to the table below to determine which option applies to you.

Distributor Ignition	Q1
Wasted Spark (6 cyl)	Q1, Q2, Q3
Wasted COP (6 cyl)	Q1, Q2, Q3, Q4, Q5, Q6
Wasted Spark (4 cyl)	Q1, Q2
Wasted COP (4 cyl)	Q1, Q2, Q4, Q5
Sequential (4 cyl)	Q1, Q2, Q3, Q6

Below is an example of a 6 cylinder wasted spark setup.



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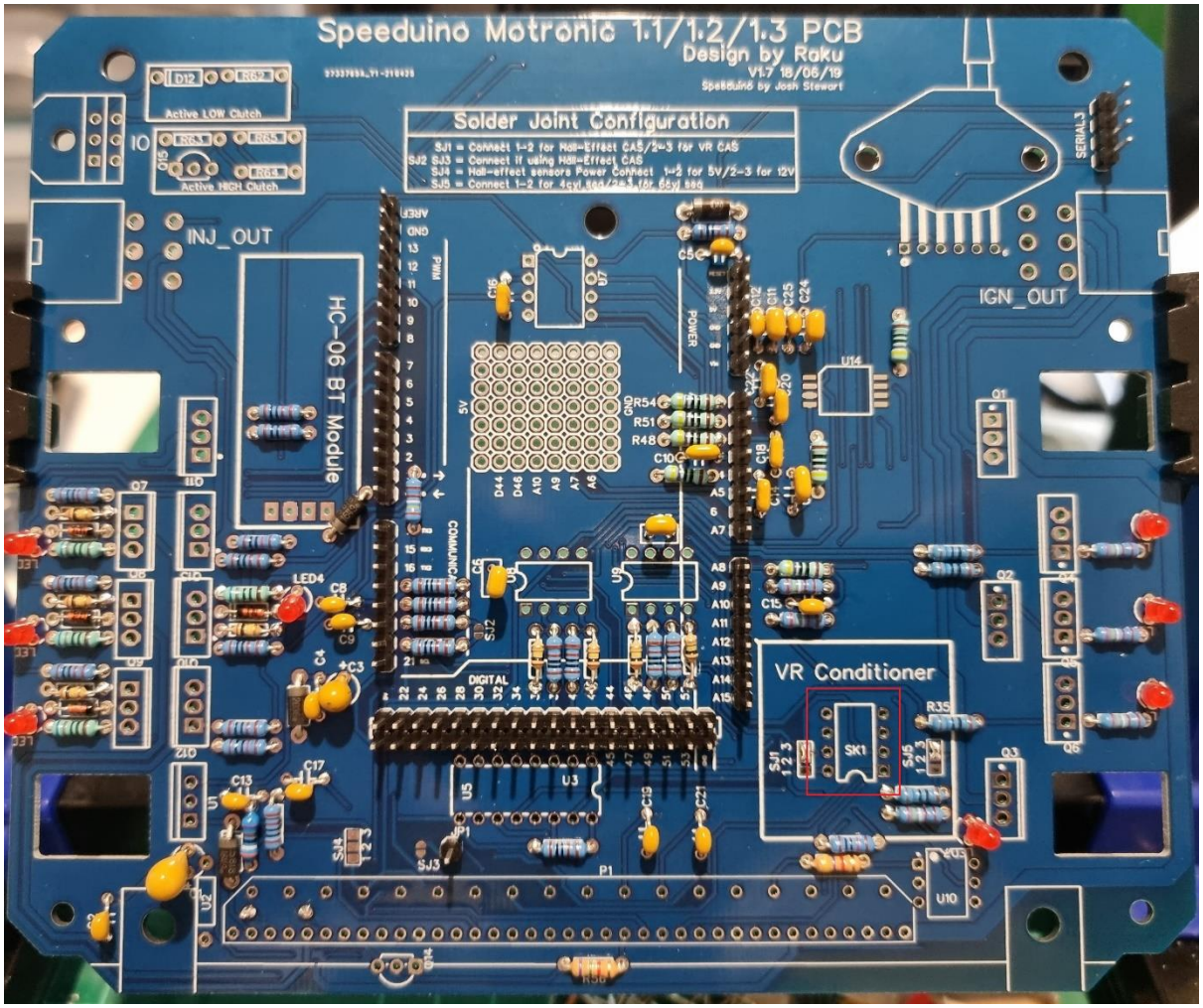
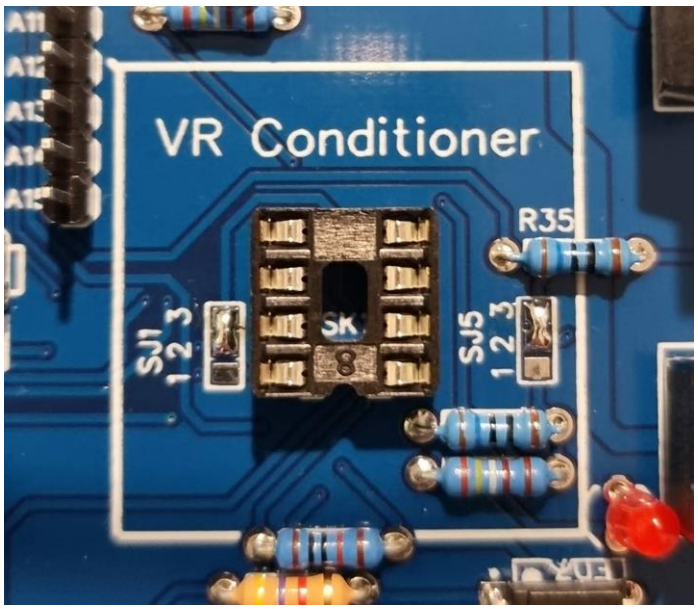


Now let’s install SK1. This is an 8 pin socket receptable that allows you to easily replace the VR conditioner. The orientation isn’t important here, but for consistency we like to match notches as shown below.



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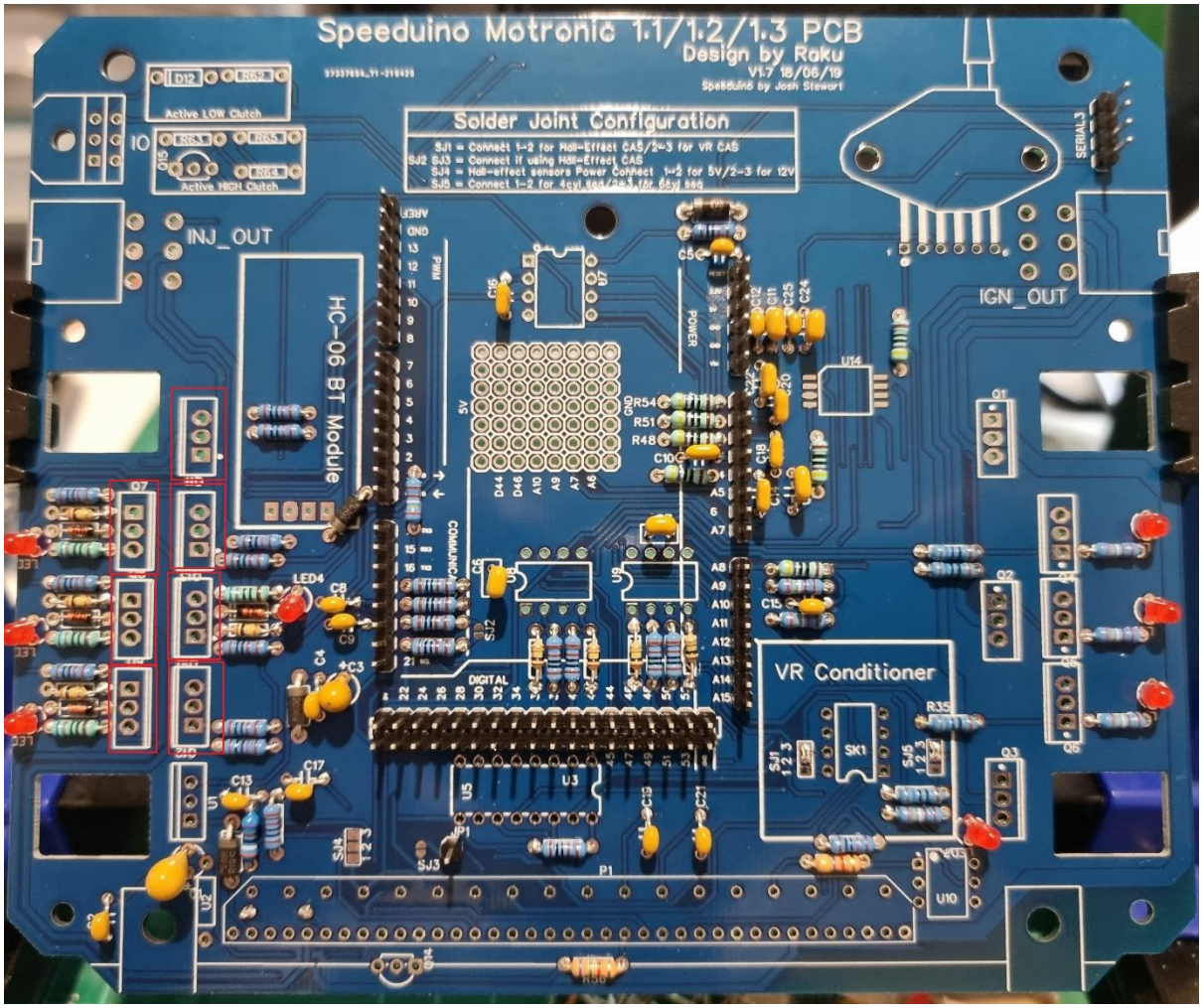
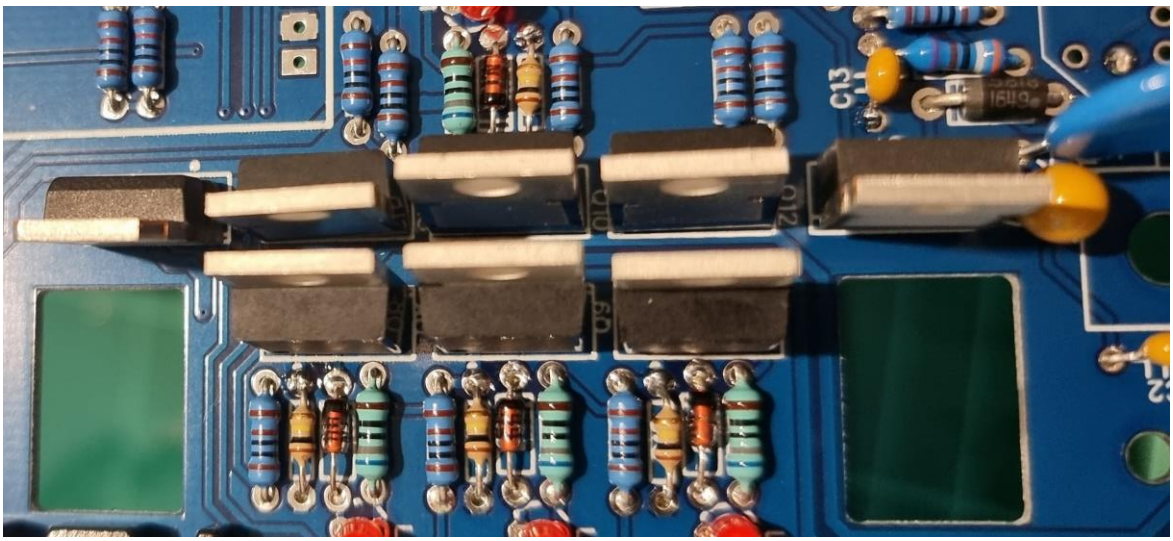


Nearly there! Now let's install Q7-Q13. Like U1, the silkscreen has an additional notch on one side to indicate where the metal/mounting hole side should face. These chips should be gently pushed in all the way. Refer to the image below for orientation. If the chips are slightly misaligned then they can be gently moved later.



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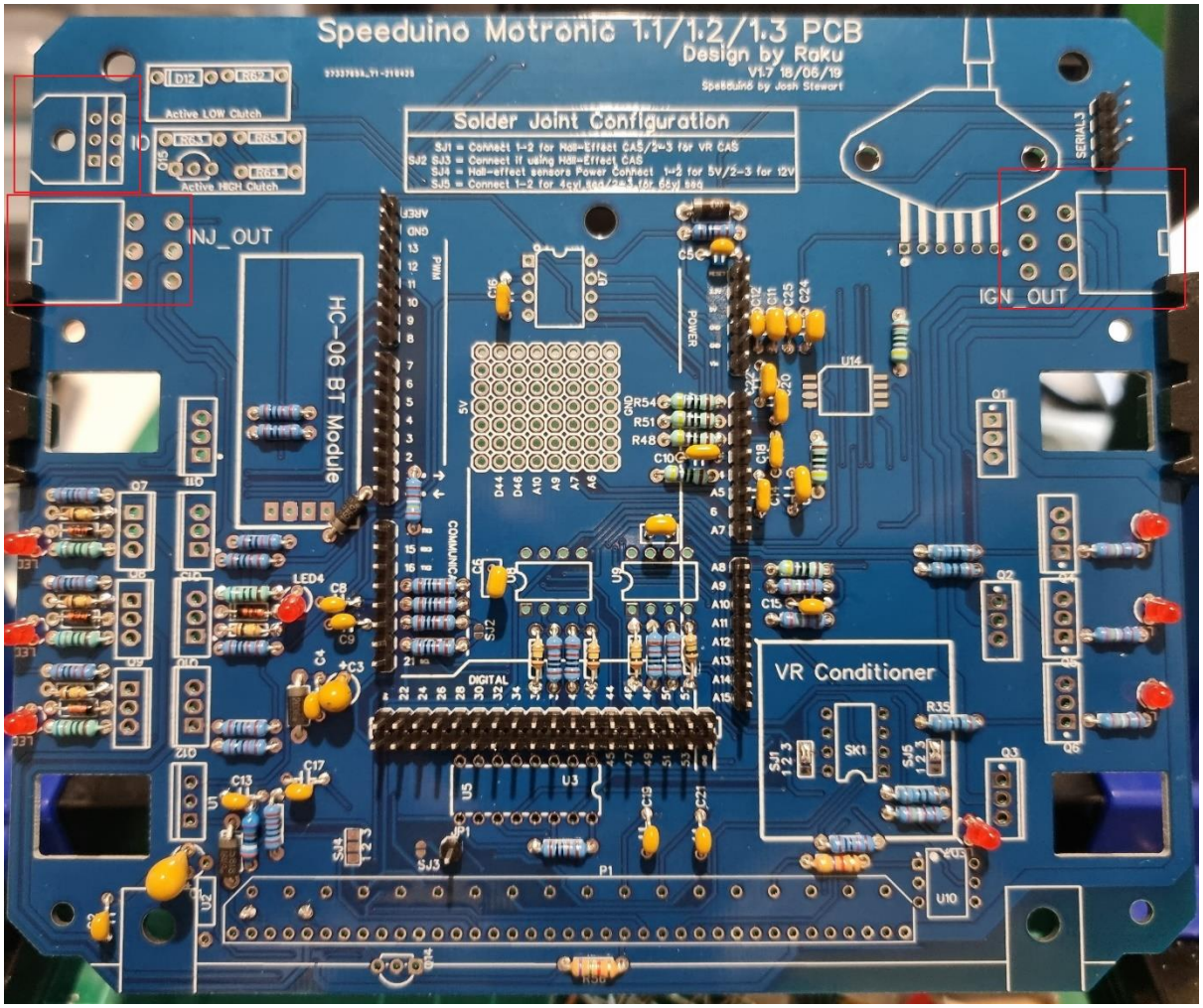
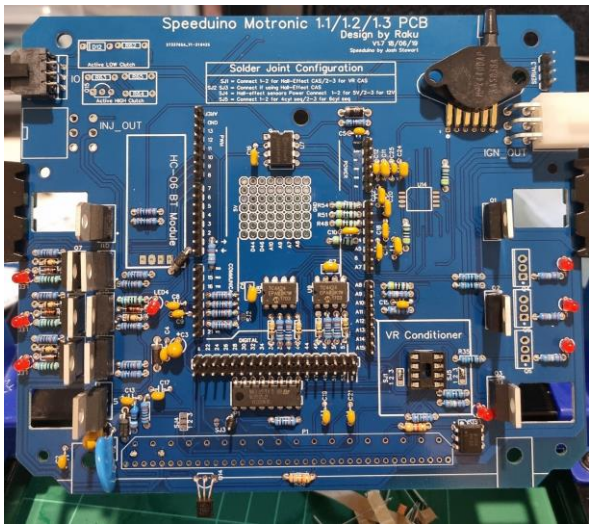


The next step is to include the external connector plugs. If you don't plan on using any of the functionality offered by these connectors, then you can leave them unpopulated, however the IO connector is recommended for wideband input. The IO connector has a locking pin that fits into the hole on the ECU. The INJ_OUT and IGN_OUT connectors require trimming of their locking pins.



In the above example, we omitted the INJ_OUT connector as we would only utilise wasted spark.

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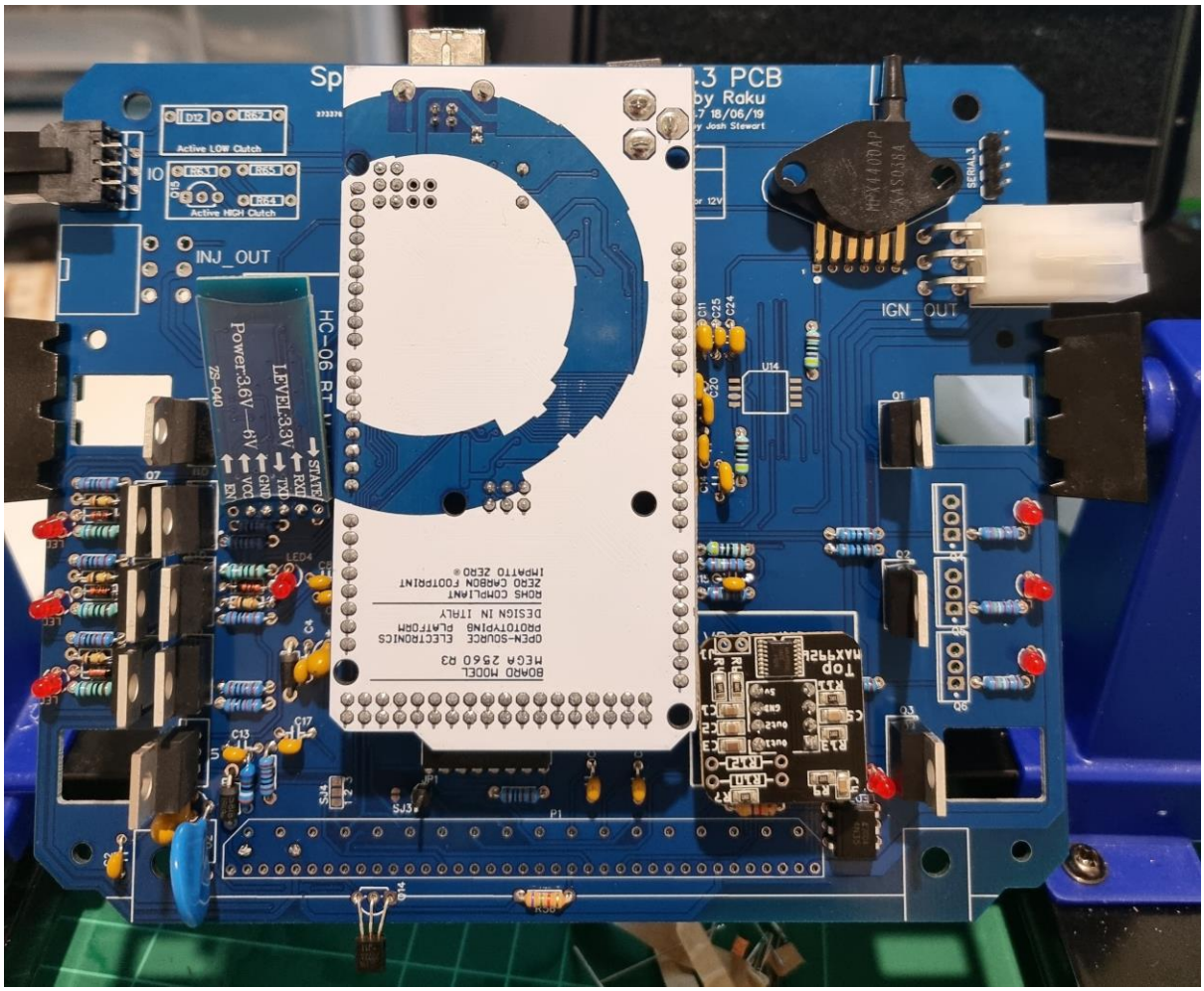
Last Steps

You can either de-solder your original ECU connector or use the one that was provided in the kit. This plug can be tricky to install as there are 55 pins that all need to perfectly align. We recommend removing the plastic retaining clip and start with the left-most pins by positioning the connector at an angle and using a set of tweezers to move the pins into their correct position. While positioning the pins, maintain pressure on the connector to the board to ensure it won't come off. Rinse and repeat for all the pins until the connector goes in (you may want a celebratory beer at this point).

Trim the pins on the underside of the board to ensure clean and easy soldering.



Lastly, we can plug the controller board back in. Refer to the picture above for the correct orientation of the VR conditioner. To install the conditioner, use the same principle as the controller board and only solder when everything is loosely connected to header pins to prevent poor alignment or pin mismatch.

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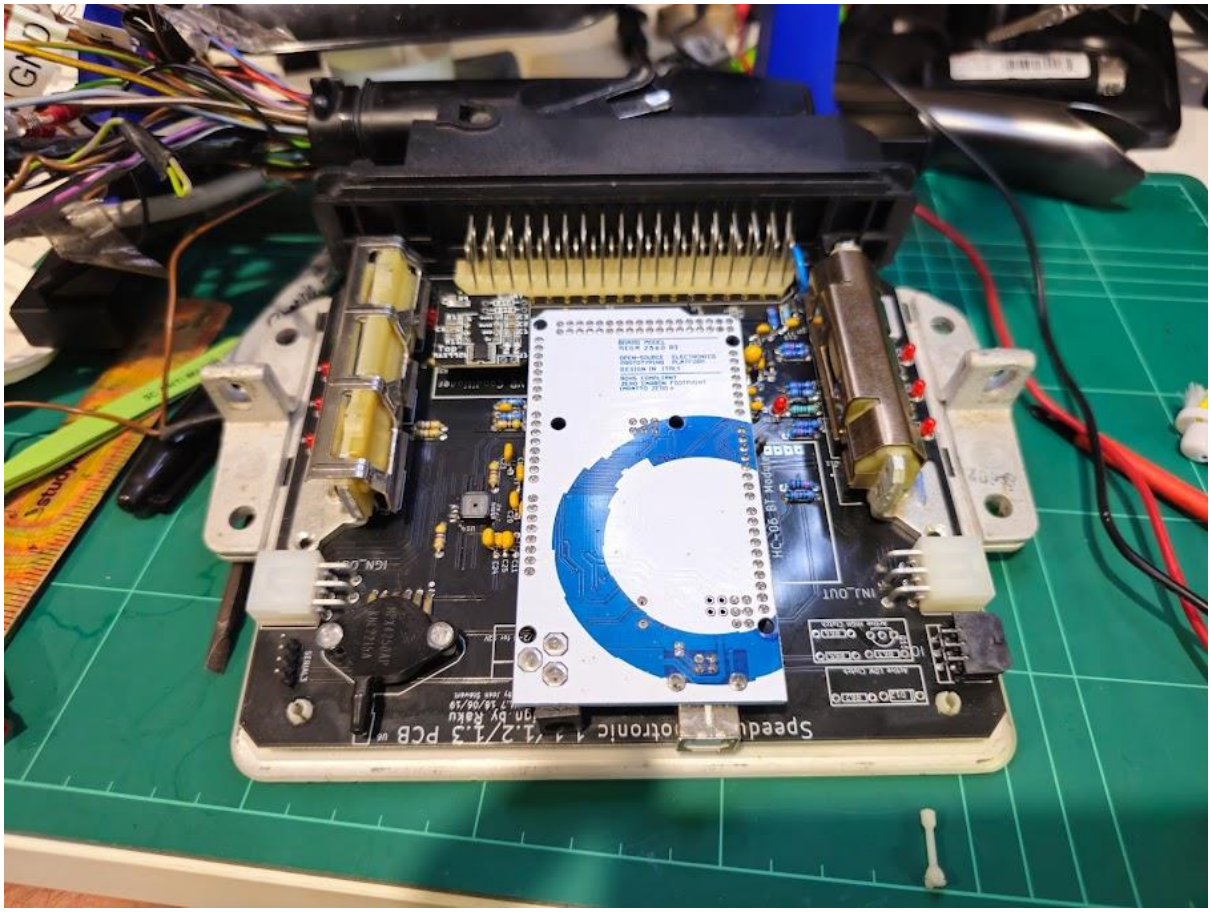

When disassembling your original ECU, you will need to drill out the rivets holding the heatsinks in place. Remove the spring clips using a flat head screwdriver and patience. Keep the thermal transfer pads and re-use them for the new board. The right heatsink (using the image above as reference) may require some trimming and shaving to accommodate the capacitor and surge protector (U2).

If you use the ECU connector provided in the kit, you will need to bend the metal retaining pin for the original connector on the enclosure base plate. Retain the enclosure base plate plastic sheet and plastic pins. The plastic pins line up on the new ECU. Push the ECU on to the pins and place the heatsink mounting blocks underneath the ECU.
Install the heatsinks, making sure to retain the thermal transfer pads between the chips and heatsink. Using the factory hardware, secure the heatsink to the base plate.

Put the plastic caps on the heatsinks and lastly, put the spring clips back on. The spring clips may require a bit of force to push back on.

Finally, measure out the positions of the plugs on your board and draw them on the enclosure top to cut out with a Dremel. As a reference, the circuit board is roughly 5mm from the bottom of the enclosure lid (measuring from the start of the flat surface after the curve on the bottom)

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Appendix

Your kit comes with additional, optional, components for the clutch circuit.

In total, there are two clutch circuits on the board which can only be populated one at a time.

The one you populate depends on the clutch switch used. The most common is a grounding switch (connects to ground when activated). Using a grounding switch means you need to populate ONLY the Active Clutch LOW circuit.

If your switch connects to +12v when activated then populate ONLY the Active Clutch HIGH circuit.