# Build the SC200...

## New high performance amplifier module

- **200W into 4Ω**
- **0.001% distortion**

**Part 2 – By NICHOLAS VINEN**

**Last month, we introduced the *SC200 Amplifier Module*. This month, we're presenting the construction details.**

**In the first article, we described the circuit** of the SC200 audio amplifier, provided a parts list and described the optional clip detection circuitry, which is housed on the same PCB.

This month, we'll go through the construction procedure, which is quite straightforward. It basically involves mounting the smaller components on the PCB, drilling the heatsink, then mounting the power devices on the heatsink and soldering their leads onto the PCB.

Before getting into the construction, there's one minor change in the design since we presented the circuit last month. We found that the best performance is obtained with the main filter inductor, L2, mounted on its side, rather than horizontally on the PCB, as shown in the photos last month. This reduces the interaction between its magnetic field and components on the PCB. Luckily, we designed the PCB with two slots for a cable tie in case we found this to be necessary. So no changes are required to the circuit or board; simply mount the inductor as shown in the photos and diagrams *this* month, rather than flat as shown in the photos last month.

We have also made provision for the SMD resistor which was previously fitted inside the hole in the middle of the bobbin to be mounted on the underside of the board, so it won't interfere with the now vertical inductor. More on that later.

### Heatsink selection

The *SC200 Amplifier Module* is built on a double-sided PCB, which is available from the *EPE PCB Service*, coded 01108161 and measuring 117 × 84mm. The seven main power transistors are arranged in a row along the top (back) edge and these are mounted on a diecast aluminium heatsink.

The power figures given last month (135W into 8Ω, 200W into 4Ω) can be obtained with entirely passive cooling (ie, no fans), provided there is sufficient ventilation where the heatsink(s) are mounted.

Having said that, it would be possible to add fan-forced cooling should, but we won't go into details here.

The heatsink used on our prototype and pictured this month measures 150 × 75 × 46mm (Jaycar HH8555) but we used that one primarily because we already had a partially drilled example in our workshop.

We recommend that you use a slightly larger 200 × 75 × 48mm heatsink (Altronics H0536) instead. This will keep the transistors cooler when the amplifier is operating at higher power levels.

There's also a 300mm-wide version of the same heatsink available for only a couple of dollars more (Altronics H0545) and if you have room for it in your chassis, the amplifier will run even cooler. But the following instructions will assume you're using the 200mm type which was specified in the parts list.

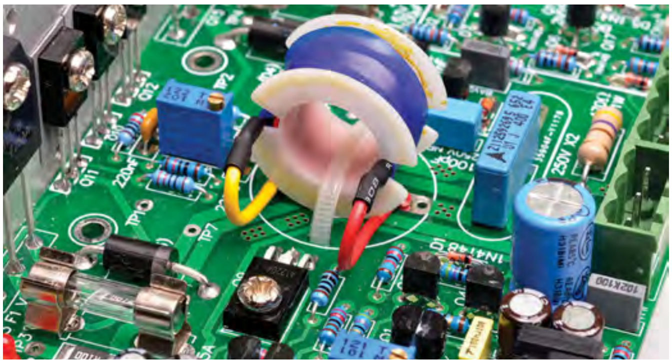
### Construction

Start by fitting the smaller components to the PCB. Use the overlay diagram, Fig.4, as a guide. Note the area in the lower right-hand corner with the dotted outline. The components in this area form the optional clip detection circuitry. If you don't need that, you may omit all those components to save time and money.

There are five 3W SMD resistors on the board and it's best to start by soldering them while the PCB will still sit flat on your bench. They are quite large so it's fairly easy to install them, although you will find it even easier if you spread a thin layer of flux paste on each associated pad before you do so. Solder the four 0.1Ω resistors first.

There are pads on either side of the board to which the 6.8Ω 3W resistor can be soldered. As mentioned earlier, we suggest you solder it to the pads on the underside so it does not interfere with the mounting of air-cored inductor L2, later.

In each case, you can clamp the resistor in place over the appropriate pads and then apply solder at each end if



**The inductor mounting shown in this close-up is a modification to that shown in the prototype (left) – see text.**

you have suitable tools. Otherwise, the simplest method is to apply solder to one of the pads and then heat it with your iron while you slide the resistor in place and allow the solder to flow onto it. You can hold the resistor with a pair of tweezers while doing this.

Once you've removed the heat, make sure it can't move before soldering the opposite end, then add a little fresh solder to the first pad to ensure the joint has formed properly. When finished, it's a good idea to inspect the joints under good light and magnification to ensure they have formed proper fillets.

By the way, we're using SMD 3W resistors since they are a lot more compact than 5W wirewound resistors and also have much tighter tolerances. And even though it is largely of academic interest as far as the circuit performance is concerned, these SMD resistors are non-inductive.

### Through-hole components

You can now solder the two small through-hole diodes, D1 and D2. Don't get these mixed up as they may look similar and ensure they have their cathode stripes oriented as shown in Fig.4[a]. If building it with the clip detector, fit diodes D5-D7 now as well.

Follow with all the quarter-watt resistors, using a DMM to check the resistance of each batch before installing them, as the coloured bands can be ambiguous. Don't forget to slip a ferrite bead over one end of the 100Ω resistor near CON1 before soldering it into place.

As stated earlier, you can leave out the nine small resistors in the clip detector circuit if you don't need it. Alternatively, if you are building it with the clip detector, fit zener diodes ZD1 and ZD2 now, with their cathode stripes as shown in the overlay diagram.

Then mount the two 1W resistors, followed by the larger diodes D3 and D4, again referring to Fig.4 for the correct orientation. This is most important as they will short out the amplifier output if reversed! Now attach medium-power transistors Q8 and Q9 using 6mm M3 machine screws and nuts, having bent their leads at right angles to fit through the mounting holes on the PCB. Don't get them mixed up; Q8 must be a KSC2690A (NPN) while Q9 is a KSA1220A (PNP). Only after their mounting screws have been done up tightly, should you solder and trim their leads.

You can now fit the LEDs to the board. In each case, the anode (longer) lead goes in the mounting hole closer to the bottom of the board, with the flat side of the lens (cathode) towards the top. You must fit LED1; LEDs2-5 are optional but highly recommended as they indicate the presence of the two power rails and the state of fuses F1 and F2. LED6 can be fitted if you are building the clip detection circuitry, or you can leave it off and use an off-board LED connected via CON4, which you will solder in place later.

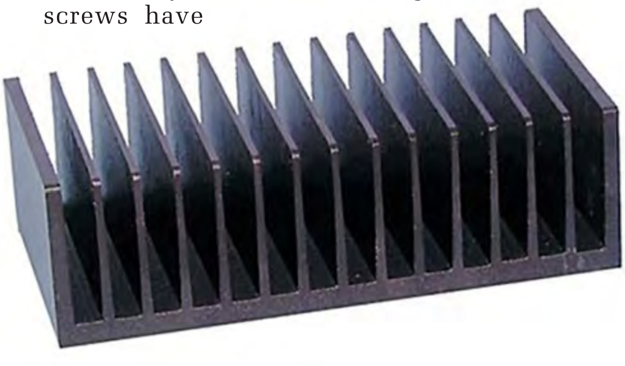
You may fit PCB pins for TP1-TP7 now. Note that there are two positions marked at TP7; they are connected to the same copper trace and are provided merely for convenience, as it's necessary to measure between TP7 and TP3-6, the latter of which are spread across the board. If you have alligator clip leads for your DMM, we recommend fitting PC stakes for one of the TP7 points along with either TP4 or TP5 (whichever is closer) but leaving the others as bare pads, since it's easier to connect to bare pads with standard pointed PCB probes.

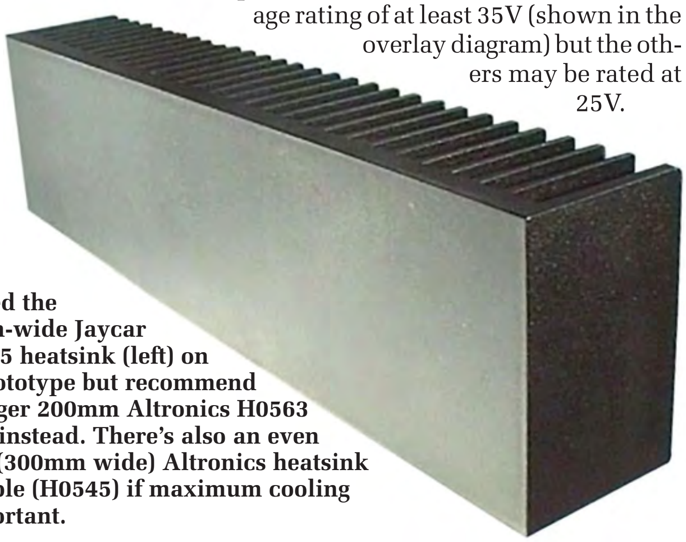
Trimpots VR1 and VR2 are next on the list. VR1 must be a 1kΩ multi-turn trimpot and it is installed with its screw towards the centre of the board, as shown. VR2 may be a mini horizontal trimpot; however, we found it quite fiddly to use this type to zero the output offset voltage so we've made provision for a multi-turn trimpot which is a bit more expensive but less sensitive. If using a multi-turn type, mount it with the same orientation as VR1, ie, with the screw towards the bottom of the board.

You can now fit the smaller capacitors. There are six MKT capacitors plus three which can be either ceramic or MKT (or in the case of the 150pF type, MKP). Polarity is not important for any of these. Follow with the small-signal transistors but don't get the different types mixed up. You will likely need to crank the leads out slightly to fit the PCB pads (use small pliers).

Three of the transistors are for the clip detection circuitry and may be omitted; note that one of these three is a 2N5551 high-voltage NPN type. The other seven (Q1-Q7) must be installed. Now you can solder the four M205 fuse clip holders in place. Make sure each is pushed all the way down on the PCB before soldering and that the retaining clip is facing towards the outside of the fuse, otherwise you will not be able to install the fuses later. Note that soldering these parts requires quite a bit of heat as they are on large copper pads.

Now install the electrolytic capacitors. The orientation is important; in each case, the longer (positive) lead should go into the pad closer to the left side of the PCB. If in doubt, refer to the '+' symbols shown in Fig.4. Note that the 47µF capacitor closest to Q5 must have a voltage rating of at least 35V (shown in the overlay diagram) but the others may be rated at 25V.





**We used the 150mm-wide Jaycar HH8555 heatsink (left) on our prototype but recommend the larger 200mm Altronics H0563 (right) instead. There's also an even larger (300mm wide) Altronics heatsink available (H0545) if maximum cooling is important.**

Now it's time to fit pluggable terminal blocks CON2 and CON3. Make sure you orient these so that the wire entry holes are on the outside. The easiest way to do this is to temporarily attach the plugs, place the sockets on the PCB and then remove the plugs before soldering the sockets. Make sure the socket pins are pushed all the way down before soldering them.

You can now also fit the input connector. There are three possibilities: either a horizontal RCA socket (CON1), vertical RCA socket (CON6) or polarised pin header to go to an off-board socket (CON5). If you wish, you can fit CON1 along with one of the other two, although you will only be able to use one at any given time.

With those in place, fit the 100nF 250V MKP capacitor which goes next to L2. There are a few different mounting holes, to suit capacitors with different pin spacings. Now would also be a good time to mount CON4 for the clip detector circuit, if you are using it with an off-board LED.

## Alternative SMD components

We won't go into a lot of detail on this topic as most constructors will probably be happy to build the amplifier using mostly through-hole components, as detailed above.

But since it was easy, we made provision on the PCB for a number of the components to be substituted with SMD equivalents. This includes small-signal transistors Q1-Q7, Q17 and Q18, diodes D1, D2 and D5-D7, zener diodes ZD1 and ZD2, the 1W resistors and the non-electrolytic capacitors.

The main reason for using optional SMD equivalents is primarily cost. It probably isn't worthwhile to go out and buy the optional SMDs for this project, but if you already have them, they would have cost you very little.

The alternative parts are shown in the panel opposite, and the mounting locations are shown in Fig.4(b). Of course, you may choose to substitute some of these parts but not all, depending on what you have on hand.

Most of the parts listed are either direct equivalents to the through-hole versions or have superior performance. They are all mounted in place of the through-hole components, on the top of the board – with two exceptions. One is D3 and D4, which if substituted, are fitted on the underside because there are too many tracks on the top side.

And while Q8 and Q9 are not listed in the parts list, nor shown in (Fig.4[b]), it is possible to substitute these with FZT696B (NPN; Q8) and FZT796A (PNP; Q9). We haven't actually tested it, but there is provision for them on the underside of the PCB (under the through-hole mounting locations) and should work *in theory*.

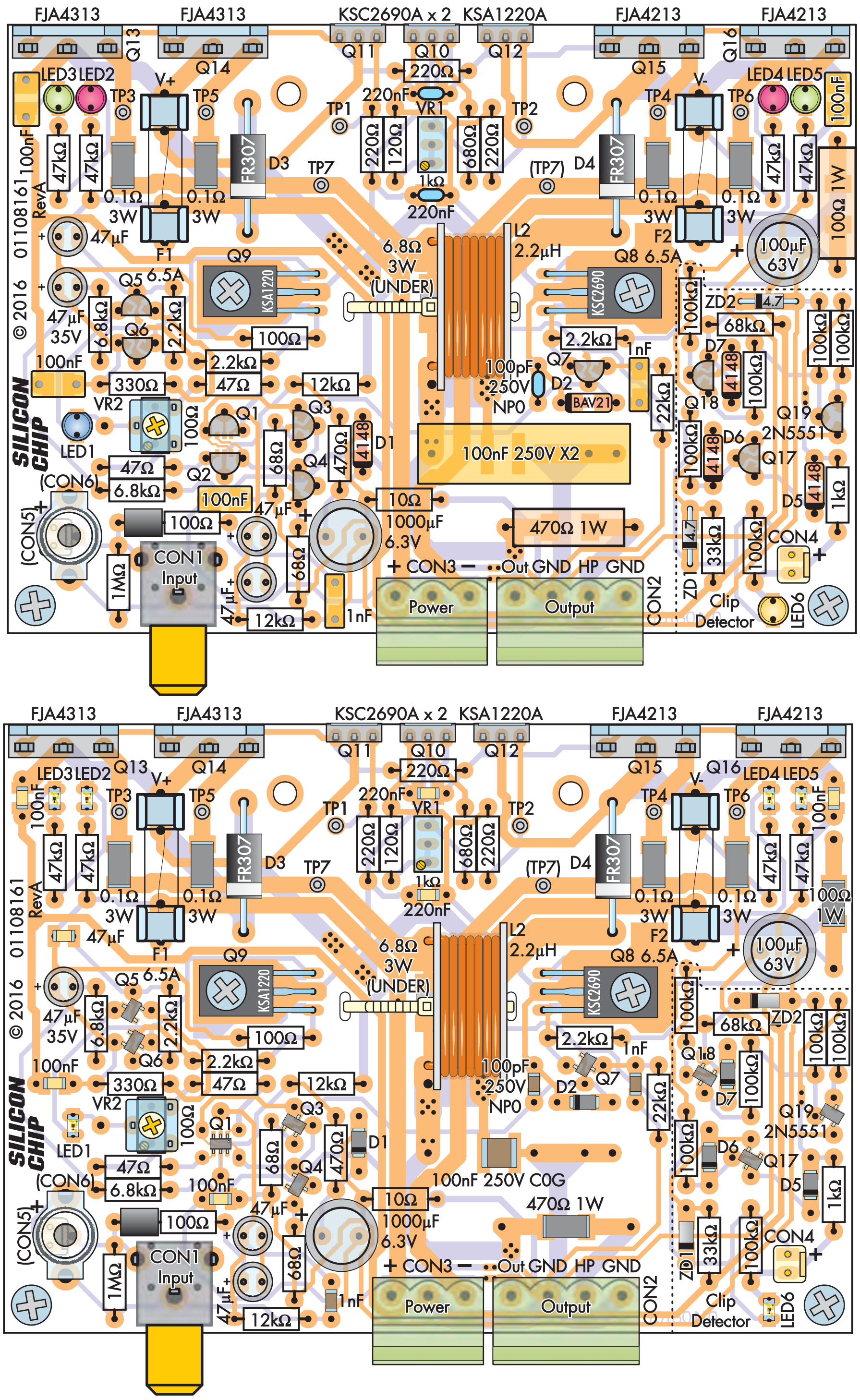


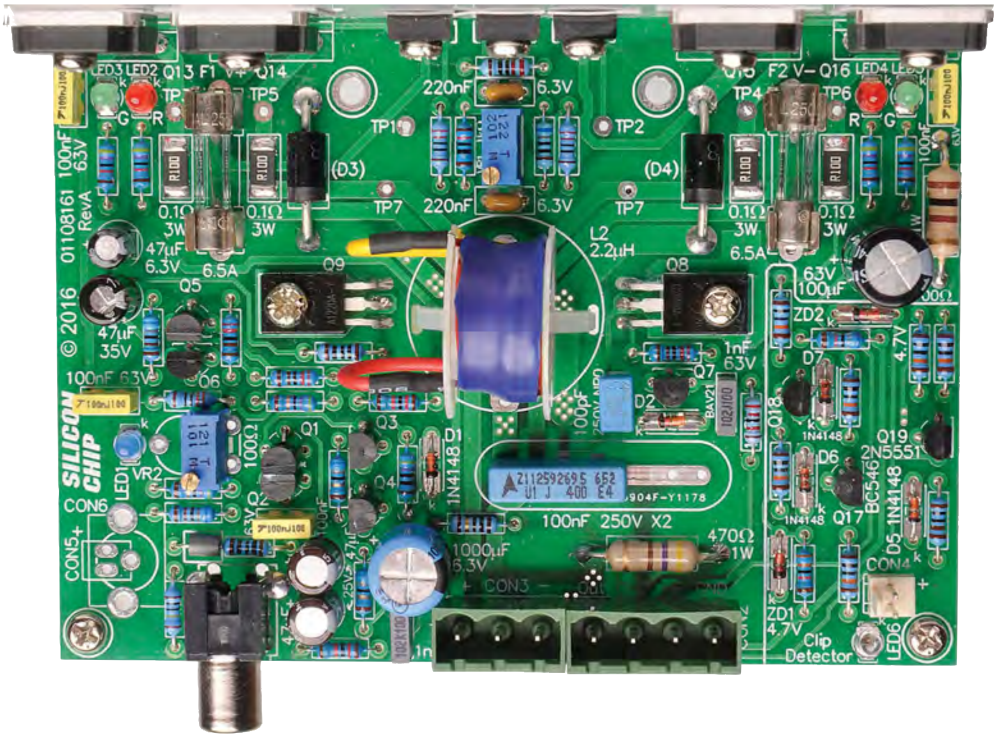

**Fig.4: two versions of the PCB component layout (the PCB itself is identical). The top (Fig.4[a]) is for those who don't like SMD components – only five are used and they're all quite large and easy to solder. The alternative (bottom) layout (Fig.4[b]) uses rather more SMDs – mainly semiconductors and capacitors. See the alternative parts list opposite.**

## Winding inductor L2

This is easiest if you make up a winding jig. See the accompanying panel for details on how to do it. You only need a few cheap and easy-to-obtain items (that you may already have), and it will come in handy any time you need to wind a small air-core choke, so we recommend that you build one if you haven't already.

The inductor is wound using a ~1m length of 1.25mm diameter enamelled copper wire on a 10mm-wide, 13mm-inner diameter plastic former bobbin. Fit the bobbin to the jig, or if you don't have a jig, wind some electrical tape around a bolt or dowel so that it is a firm fit through the centre of the bobbin, to prevent the plastic breaking while winding on the copper wire.

For a neat result, the wire can first be straightened by securing one end in a vice and pulling hard on the other end with a large pair of pliers. This



**This completed PCB matches the 'through-hole' version opposite (Fig.4[a]). In the surface-mount version (Fig.4[b]) the SMD components are in the same positions as the through-hole versions above – but watch the polarity!**

requires a fair bit of strength so be careful in case the pliers or vice let go. Make a right-angle bend in the wire 25mm from one end, then insert this end through one of the slots in the bobbin and wind on seven close-packed turns, which should fill the width of the bobbin. In case the winding direction affects performance, we recommend that you wind in the same direction as we did, as shown in the photo.

Once that layer is complete, wind another 6.5 turns on top, again close packed and in the same direction, then bend the wire through the opposite slot it started through and cut it off 25mm from the bobbin.

To hold the windings in place, cut a 10mm length of 20mm-diameter heatshrink tubing and slip it over the bobbin, then shrink it down gently using a hot air gun on a low setting. Trim the two protruding wires to exactly 20mm from the base of the bobbin, then strip 5mm of the enamel from each end using either emery paper or a hobby knife/scalpel and tin the leads.

To get the specified performance, you must mount the inductor as shown in Fig.4 and in the photos. Two slots are provided for a cable tie to hold it in place. Bend its leads to fit through the appropriate pad, then fit and tighten the cable tie before soldering and trimming the leads. Note the way we've oriented it; each wire from the PCB runs up and over the top of the bobbin.

### Drilling and tapping the heatsink

The mounting locations for the power devices on the heatsink are detailed on the accompanying panel, which incorporates a drilling diagram. As explained in that panel, you have the option of either tapping the seven holes, which is the neatest solution, or offsetting the holes by around 5mm in either direction (left or right, to clear the heatsink fins) and then drilling them all right through the heatsink. You can then attach the power devices using longer (~15mm) machine screws fed between through the fins.

This is the approach we took for the prototype as it's a lot less work, however, you do have to be very accurate in drilling the holes, both in terms of the initial position and in making sure that they are drilled at right angles to the heatsink face. If any of the holes are off by more than about half a millimetre, you will find it between tricky and impossible to fit the nuts to the screw shafts. If you decide to tap the holes instead, while this is more work and requires some patience, the exact hole positions are no longer quite so critical.

After you have drilled and possibly tapped the transistor mounting holes, you will also want to do something about mounting it in the chassis. Our preferred method is to drill and tap three additional holes along the bottom of the heatsink to hold it in place. However, it's also possible to fit right-angle brackets to the fins at either end of the heatsink by drilling right through them and using screws and nuts to hold them in place.

Once all holes have been drilled, deburr them using an over-sized drill bit and clean off any aluminium particles or swarf. Check that the areas around the holes are perfectly smooth to avoid the possibility of puncturing any of the insulating washers.

### Final assembly

Now it's time to mate the PCB with the main heatsink but first, re-check the face of the heatsink. All holes must be deburred and it must be perfectly clean and free of any grit or metal swarf.

Start the heatsink assembly by mounting transistors Q10, Q11 and Q12 (see Fig.6). A silicone rubber washer goes between each of these transistors and the heatsink. If you can't get TO-126/TO-225 insulating washers, you can carefully cut down some TO-220 washers to fit the devices. Make sure they're small enough to fit side-by-side on the heatsink but not so small that you risk any contact between the metal pad on the rear of each device and the face of the heatsink.

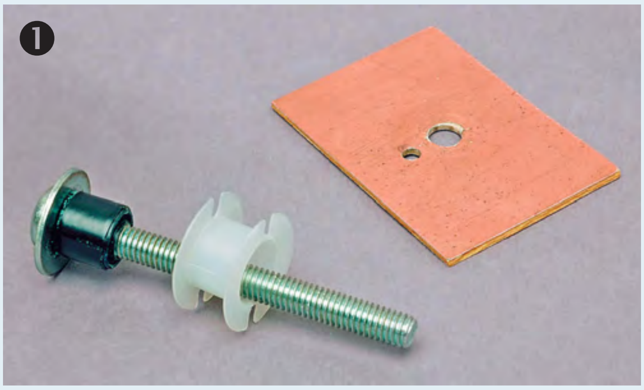
## Alternative SMD parts

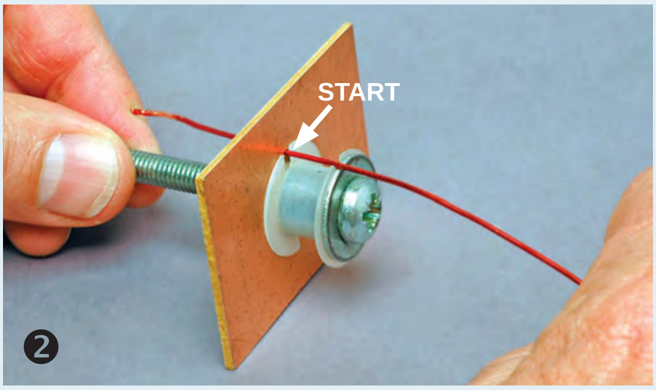
**Semiconductors**
3 BC846 transistors (Q3,Q4,Q7)
4 BC856 transistors (Q1,Q2,Q5,Q6)
1 blue SMD 3216/1206 LED (LED1)
2 red SMD 3216/1206 LED (LED2,4)
2 green SMD 3216/1206 LED (LED3,5)
1 LL4148 or similar small-signal diode (D1)
1 BAV21W-TP schottky diode (D2)
2 VS-3EJH02 hyperfast rectifiers (D3,D4)

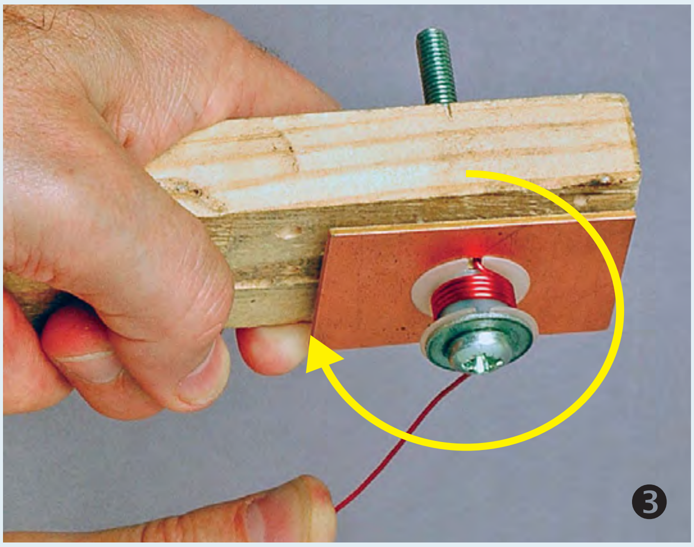
**Resistors**
1 470Ω 1W 5% SMD 6332/2512
1 100Ω 1W 5% SMD 6332/2512

**Capacitors**
1 47µF X5R 6.3V SMD ceramic 3216/1206
2 220nF X7R 50V SMD ceramic 3216/1206 or 2012/0805
1 100nF 250V C0G SMD ceramic 5652/2220 or 4532/1812
4 100nF X7R 100V SMD ceramic 3216/1206 or 2012/0805
2 1nF C0G 100V SMD ceramic 3216/1206 or 2012/0805
1 150pF C0G 250V SMD ceramic 3216/1206 or 2012/0805

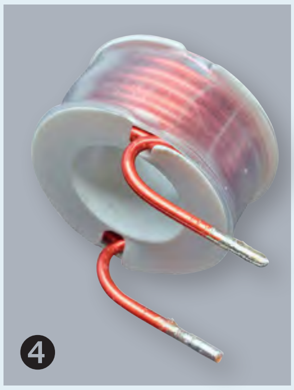
# Making a winding jig for the 2.2µH inductor




**These photos show how the winding jig is used to make the 2.2µH inductor. First, the bobbin is slipped over the collar on the bolt (1), then an end cheek is attached and the wire threaded through the exit slot (2). The handle is then attached and the coil tightly wound onto the bobbin using 13.5 turns of 1.25mm-diameter enamelled copper wire (3). The finished coil (4) is secured using one or two bands of heatshrink tubing around the outside.**




The winding jig consists of an M5 × 70mm bolt, two M5 nuts, an M5 flat washer, a piece of scrap PCB material (approximately 40 x 50mm) and a scrap piece of timber (approximately 140 × 45 × 20mm) for the handle.

In use, the flat washer goes against the head of the bolt, after which a collar is fitted over the bolt to take the bobbin. This collar should have a width that's slightly less than the width (height) of the bobbin and can be wound on using insulation tape.

Wind on sufficient tape so that the bobbin fits snugly over this collar without being too tight.

Next, drill a 5mm hole through the centre of the scrap PCB material, followed by a 1.5mm exit hole about 8mm away that will align with one of the slots in the bobbin. The bobbin can be slipped over the collar, after which the scrap PCB 'end cheek' is slipped over the bolt (ie, the bobbin is sandwiched into position between the washer and the scrap PCB).

Align the bobbin so that one of its slots lines up with the exit hole in the end cheek, then install the first nut and secure it tightly. The handle can then be fitted by drilling a 5mm hole through one end, then slipping it over the bolt and installing the second nut.

If the holes are tapped, these three transistors can be secured using M3 × 10mm machine screws. Alternatively, if you have drilled non-tapped holes, use M3 × 15mm or 20mm machine screws, with the screws coming through from the heatsink side (ie, the screw heads go between the heatsink fins).

Make sure the three transistors and their insulators are properly vertical, then do the screws all the way up but don't tighten them yet; ie, you should still just be able to rotate the transistors.

The next step is to fit an M3 × 9mm (or 10mm) tapped spacer to each of the four mounting holes on the PCB. Secure these using M3 × 6mm machine screws. Once they're on, sit the board down on the spacers and lower the heatsink so that the transistor leads pass through the appropriate holes.

The four output transistors (Q13-Q16) can now be fitted. Two different types are used, so be careful not to mix them up (check the layout diagram). As shown in Fig.6(b), these devices must also be insulated from the heatsink using silicone insulating washers.

Start by fitting Q13. The procedure here is to first push its leads into the PCB mounting holes, then lean the device back and partially feed through its mounting screw with a flat washer. Hang the insulating washer off the end of the screw and then loosely screw the assembly to the heatsink.

The remaining three devices are then installed in exactly the same way but take care to fit the correct transistor type at each location. Once they're in, push the board down so that all four spacers (and the heatsink) are in contact with the benchtop. This automatically adjusts the transistor lead lengths and ensures that the bottom of the board sits 9-10mm above the bottom edge of the heatsink.

Now adjust the PCB assembly horizontally so that the transistor leads are as vertical as possible. If you have tapped the holes, and assuming you're using the specified 200mm-wide heatsink, this will be when each side of the PCB is 41.5mm in from its adjacent heatsink end. Once you are sure it is properly positioned, tighten all the transistor screws just enough so that

# Drilling and tapping the aluminium heatsink

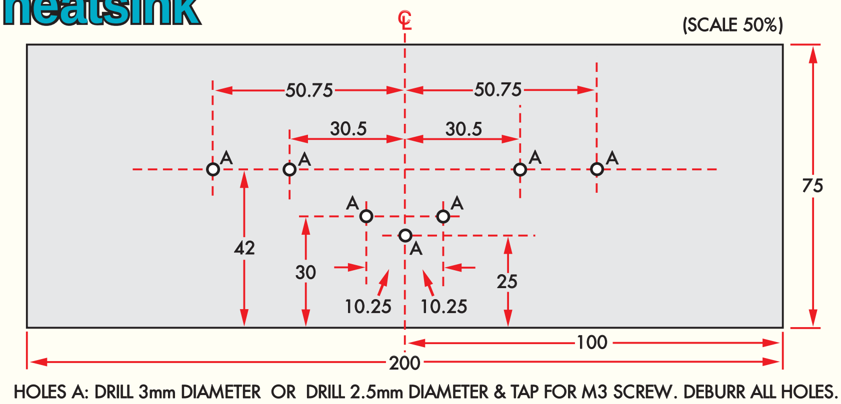



**Fig.5: this half-size diagram shows the heatsink drilling details. The holes can either be drilled and tapped (using an M3 tap) or can be drilled to 3mm and the transistors mounted using machine screws, nuts and washers.**

Fig.5 above shows the heatsink drilling details. If tapping the holes, they should be drilled to 2.5mm diameter **right through the heatsink plate** and then tapped to 3mm. Alternatively, the holes can be drilled through using a 3mm drill and the transistors mounted using screws, nuts and washers.

It's somewhat more work to tap the holes, but it makes mounting the transistors quite a bit easier (no nuts required) and gives a much neater appearance.

Before drilling the heatsink, you will have to carefully mark out the hole locations using a very sharp pencil. Then use a small hand-drill fitted with a 1mm bit to start the location of each hole. This is important as it will allow you to accurately position the holes (the locations are critical) before stepping up to larger drills in a drill press.

Be sure to use a drill press to drill the holes (there's no way you'll get the holes perfectly perpendicular to the mounting face without one). Use a small pilot drill to begin with (eg, 1.5mm), then carefully step up the drill size to either 2.5mm or 3mm. The holes have to go between the fins so it's vital to accurately position them. In addition, you can drill (and tap) three holes in the base of the heatsink so that it can later be bolted to a chassis.

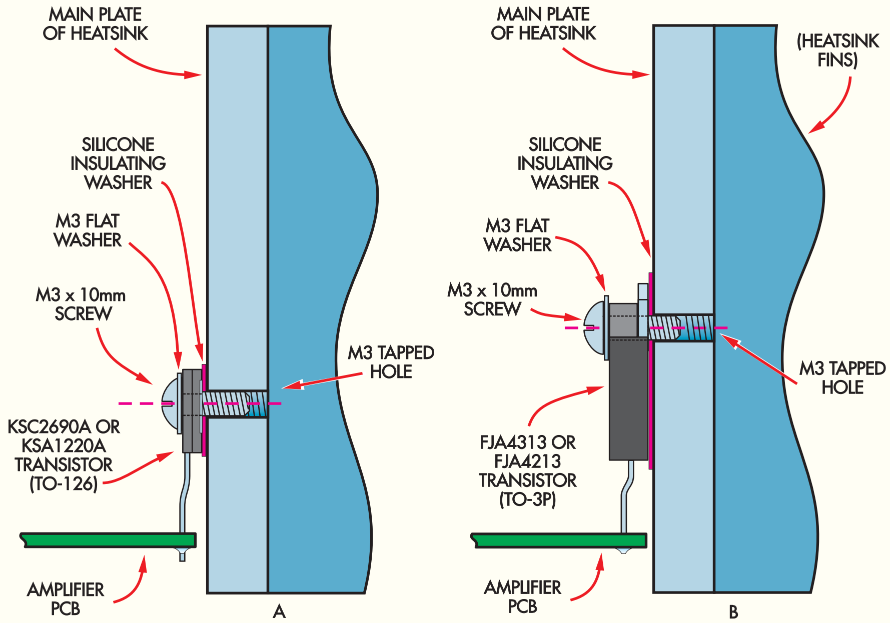



**Fig.6: here's how the driver (left) and power (right) transistor are secured to the heatsink. Ensure there is no short between the collectors and heatsink.**

Be sure to use a suitable lubricant when drilling the holes. Kerosene is the recommended lubricant for aluminium but we found that light machine oil (eg, Singer or 3-in-1) also works well for jobs like this.

Don't try drilling the holes in one go. When drilling aluminium, it's important to regularly remove the bit from the hole and clear away the metal swarf. If you don't do this, the aluminium swarf has a nasty habit of jamming the drill bit and breaking it. Re-lubricate the hole and the bit with oil each time before you resume drilling.

## Tapping

To tap the holes, you need an M3 intermediate (or starting) tap (not a finishing tap). The trick is to take it nice and slowly. Keep the lubricant up and regularly wind the tap out to clear the metal swarf from the hole. Re-lubricate the tap each time before resuming.

Do not at any stage apply undue force to the tap. It's easy to break a tap in half if you are heavy-handed and if the break occurs at or below the heatsink's face, you can scratch both the tap and the heatsink (and about $25). Similarly, if you encounter any resistance when undoing the tap from the heatsink, gently rotate it back and forth and let it cut its way back out. In short, don't force it.

Having completed the tapping, deburr all holes using an oversize drill to remove any metal swarf from the mounting surface. The mounting surface must be perfectly smooth to prevent punch-through of the transistor insulating washers.

Finally, the heatsink should be thoroughly scrubbed cleaned using water and detergent and allowed to dry.

Fig.6 (left) shows the mounting of the amplifier to the heatsink once all the above drilling and tapping is completed.

Note differences between the driver (left) and power (right) transistors. It is imperative that silicone insulating washers are used to isolate the transistors from the heatsinks; you can easily check this with your multimeter on a high 'ohms' range between the collectors and heatsink.

ANY reading will mean there is a problem – sort it out before continuing or the transistor life can be measured in milliseconds when you apply power.

they are held in place while keeping the insulating washers correctly aligned.

The next step is to lightly solder the outside leads of Q13 and Q16 to their pads on the top of the board. The assembly is then turned upside down so that the heatsink transistor leads can be soldered. Before soldering the leads, though, it's important to prop the front edge of the board up so that the PCB is at right-angles to the heatsink. If you don't do this, it will sag under its own weight and will remain in this condition after the leads have been soldered.

A couple of cardboard cylinders cut to 63mm can be used as supports (eg, one at each corner). With these in place, check that the board is correctly centred on the heatsink, then solder all 21 leads. Make sure the joints are good since some can carry many amps at full power.

Once the soldering is completed, trim the leads and remove the two supports near the heatsink, as these are no longer required; the transistors should be mounted to the chassis via the heatsink only, otherwise, thermal cycling could crack their solder joints.

Now turn the board right way up again and tighten the transistor mounting screws to ensure good thermal coupling between the devices and the heatsink. Don't over-tighten the mounting screws, though. Remember that the heatsink is made from aluminium, so you could strip the threads if you are too ham-fisted.

### Checking device isolation

You must now check that the transistors are all electrically isolated from the heatsink. That's done by switching your multimeter to a high ohms range and checking for shorts between the heatsink mounting surface and the collectors of the heatsink transistors (note: the collector of each device is connected to its metal face or tab).

For transistors Q11-16, it's simply a matter of checking between each of the fuse clips closest to the heatsink and the heatsink itself (ie, on each side of the amplifier).

That's because the device collectors in each half of the output stage are connected together and run to their respective fuses.

Transistor Q10 (the VBE multiplier) is different. In this case, you have to check for shorts between its centre (collector) lead and the heatsink.

In either case, you should get an open-circuit reading. If you do find a short, undo each transistor mounting screw in turn until the short disappears. It's then simply a matter of locating the cause of the problem and remounting the offending transistor.

Be sure to replace the insulating washer if it has been damaged in any way (eg, punched through).

### Power supply

The power supply requirements for this module are optimal with supply rails of ±55-60V, nominally ±57V, from a 45-0-45 transformer. We will present the details next month.

A single 300VA transformer is sufficient to power a stereo amplifier for amplifying normal program material, although it will not allow continuous full power output from both channels simultaneously.

For that, you would need either one transformer rated for at least 500VA, or a separate 300VA transformer and power supply per channel.

For lower-power applications, a 160VA 45-0-45 transformer is available (Altronics M5345A). We wouldn't recommend using this for stereo applications, but it would be suitable for a single channel amplifier if continuous full-power delivery is not required.

If you don't need the full 135W/200W rating, there's also the possibility of using a smaller transformer with lower voltage secondaries, for example, a 160VA 30-0-30 transformer (eg, Altronics M5330A).

Some components would need to be changed; we'll have more details on that next month.

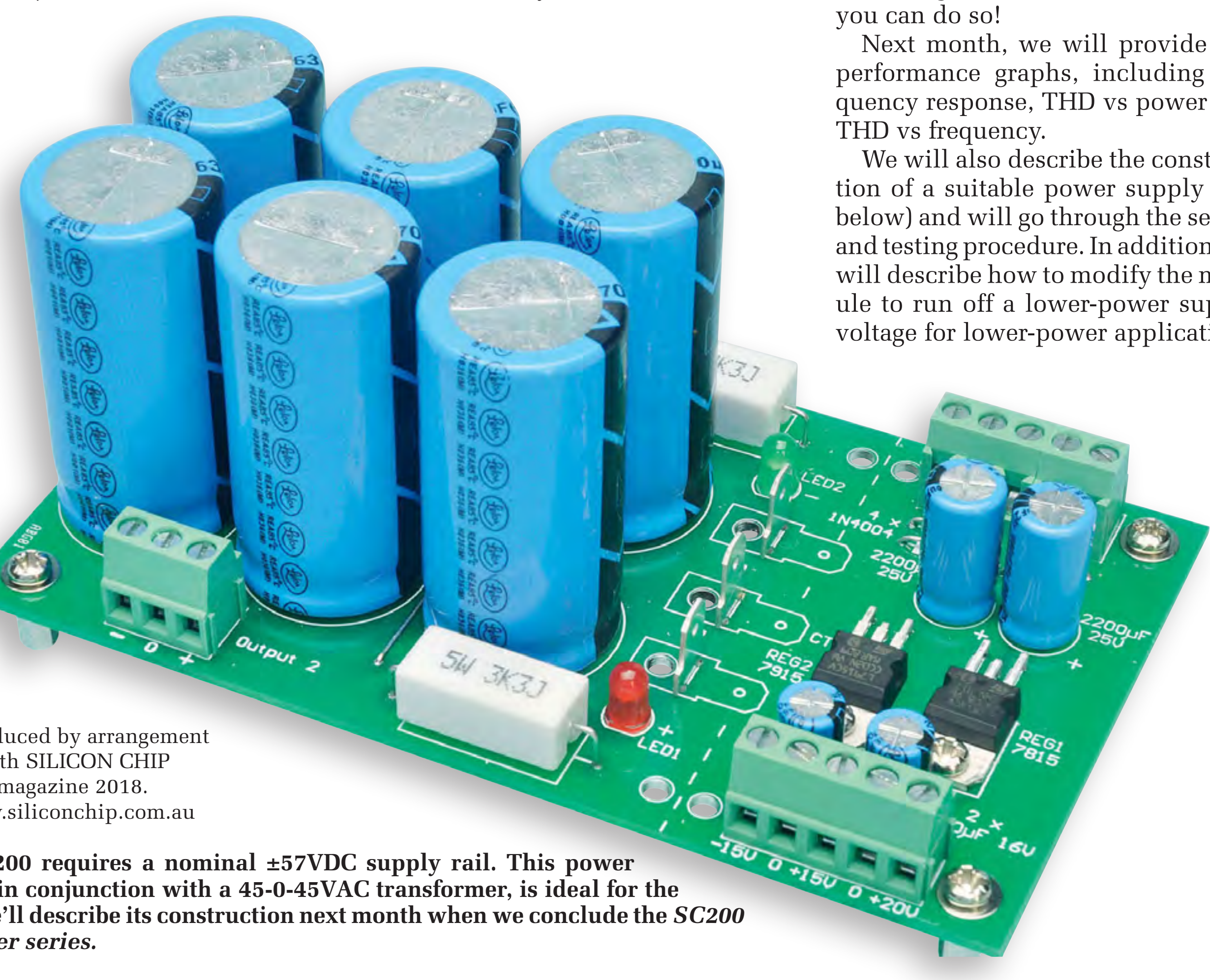
Note that a complete amplifier also requires a speaker protection module. This is important since a fault in the amplifier PCB can easily destroy your speaker(s) and even set them on fire! A suitable design in kit form is available from Altronics (cat K5167). This module will protect one or two speakers, so a stereo amplifier only requires one to be built.

### Next month

Well, that's a lot to devour in one month – but at least we've given you all the construction details, so if you want to get stuck into construction, you can do so!

Next month, we will provide full performance graphs, including frequency response, THD vs power and THD vs frequency.

We will also describe the construction of a suitable power supply (see below) and will go through the set-up and testing procedure. In addition, we will describe how to modify the module to run off a lower-power supply voltage for lower-power application.






**The SC200 requires a nominal ±57VDC supply rail. This power supply, in conjunction with a 45-0-45VAC transformer, is ideal for the task. We'll describe its construction next month when we conclude the *SC200 Amplifier series.***