# Oakley Sound Systems

# Parts Guide

## A guide to buying parts for Oakley Sound projects

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# Introduction

Please ensure that you have the most up to date Builder's Guide and User Manual before starting to purchase components and building your project. I do occasionally make small changes to the project parts list in the Builder's Guides from time to time to improve performance, as well as correct for any mistakes, and add any further information that may help you with your build.

This document is my generalised parts guide for all of the Oakley Sound projects. It is intended to be a one stop information pack for all UK builders of Oakley equipment, as well as being, I hope, a great help to those customers in other parts of the world.

The first part will give details about the sort of parts we use in the various Oakley projects. It is a generalised round up so don't be too alarmed to find that there will be a few things in here that will have nothing to do with the project you are building right now.

The second part contains Rapid, Farnell ,and increasingly Mouser, part numbers for some of our most common parts. However, it is not a complete list of part numbers, nor is it always up to date, although I try to to keep it as current as possible. All suppliers have a habit of changing their part numbers from time to time as they source from one manufacturer to another. Also, some parts simply become obsolete and are no longer available any more. I do try and make sure all current circuit boards use easily available parts.

If you do find a problem in getting hold of a part, why not ask for help at the “Oakley Sound Systems” forum at www.muffwiggler.com. It is always worthwhile to have a quick search on the forum to see if someone else has asked the very same question before. Please do not contact me directly for help with supplier part numbers. Honestly, I would love to help but I haven't got the time to answer these sorts of queries directly.

For general information on how to build our modules, including circuit board population, mounting front panel components and making up board interconnects please download the current version of our Construction Guide at www.oakleysound.com/construct.pdf.

Please note that although I have tried to make sure that no errors have occurred in the preparation of this document, I do not accept any liability for any inconvenience or losses of any kind caused by the information presented in this document. If you do find any errors or obsolete information in this or any other of my documentation please do let me know either directly or via the forum.

The source file for this document can be found at www.oakleysound.com/parts.odt. This is an OpenOffice format and can be freely edited for your own personal use.

# A Guide to the Parts Used in Oakley Sound Projects

Most of the parts for our projects are easily available from your local parts stockist. I use Rapid Electronics, Farnell, CPC and RS Components here in the UK. Rapid are probably the best source of individual parts for UK builders, they are cheap, reasonably quick and very rarely make mistakes.

Farnell, and its sibling CPC, are massive and not completely geared up to dealing with the little person who only wants to buy small numbers of through hole components. However, they both have a good online service and are sometimes cheaper than Rapid, especially if you need something in large quantities. Even though CPC is part of the Farnell group you can sometimes get things cheaper from their site. As of 2019 Farnell have been deleting a lot of their through hole ICs. This is a shame but that is the nature of the large scale electronics manufacture these days.

Mouser are a US based company but sell direct to the UK via their website. For many parts, especially the semiconductors and sockets, it is cheaper to buy at Mouser even if you are in the UK. They sort out the VAT and other importing stuff so ordering through Mouser is actually very easy. If you order over £33 worth of items you get free postage. Service is very quick – sometimes faster than Rapid. Mouser are fast becoming my favourite supplier.

Many other parts are available via the various sellers on Ebay. These are particularly useful for the rarer or vintage parts. However, do be aware of the many Chinese sellers that appear to sell an excellent range of parts but are actually selling counterfeit goods or, worse, complete fakes. I have bought several counterfeit devices that actually work quite well but they are very rarely as well made as the original so longevity could be a problem.

On the main modular project page on the Oakley Sound website there is a link to GTXDude's bumper project parts lists. This single zipped file has spreadsheets containing Mouser part numbers for 25 Oakley projects. It is getting a little old now and many of the parts lists are out of date. However, it can be still useful as a source of US based part numbers for any Oakley build. If anyone would like to update any of the spreadsheets then please do so and upload them to the forum.

**Full kits and Panels**

SynthCube in the US sell front panels and complete kits for several Oakley projects:

http://synthcube.com/cart/

## Resistors

The through hole resistors can be 5% carbon 0.25W types except where a more accurate part is stated in the parts lists. However, I recommend that you use 1% 0.25W metal film (MF) resistors throughout your build since these are very cheap nowadays and offer exceptional stability and noise. It also means that the colour codes match up on all your resistors; 5% types have often only four bands while metal film have five band codes so mixing the two different types can cause confusion. There is no sonic advantage to using carbon composition resistors in low voltage audio projects.

If you do want to use 5% types, to save money perhaps or because you have a bunch of them stashed away, then please note that sometimes a project will specify that some of the resistors **have to** be 1% or better types. Failure to use good quality parts in these locations will affect the performance of your project. These critical parts are indicated in the project's parts list.

Some high resistance values are not easily obtained in metal film. Values over 1M (one million ohms) are often hard to find. However, you can feel reassured that any Oakley project that uses a resistor with these high values can normally use a 5% part.

Some projects make use of precision 0.1% resistors. These are normally available in packs of five or even individually because they are considerably more costly than ordinary metal film resistors. When an Oakley parts list says use 0.1% there is usually a good reason for doing so.

For those projects that use surface mounted parts I do recommend that you use 1% metal film resistors. The size style is 0805 (or 2012 in metric) and they should be rated at 1/8W (125mW or 0.125W). Look for ones with a temperature coefficient of +/-100ppm/K or smaller. I typically use Vishay's CRCW thick film series. For example, Vishay part number: CRCW080533K0FKEA which is a 33K resistor.

For surface mount resistors, thin film types offer lower noise than the thick film types. I normally use thick film as they are more easily available, are cheaper and for the most part perform adequately. If the design requires more stability and lower noise then thin film types are to be preferred.

Resistors, surface mount or through hole, being relatively cheap items typically cannot be bought in ones or twos. Resistors then tend to come on a long tape usually with at least ten, or more commonly one hundred devices, attached. If you can buy them in singles you'll notice the price drops rapidly with the more parts you order. One hundred resistors may cost only double what ten would cost.

## Temp Co Resistors

Temp co resistors are positive temperature coefficient (PTC) resistors that I use for temperature compensation in the VCOs and VCFs. Akaneohm make a small through hole 1K +3300ppm/K type which is slightly less sensitive that the desired +3500ppm/K but it is good enough in many situations. I typically use this device with less critical projects like VCFs or the VC-LFO. This part usually available from me, or from Thonk and Synthcube.

For the various VCO modules projects I recommend the bulky C-2AQ 1K 1W wirewound resistors with a nominal temperature coefficient of +3500ppm/K. You can buy these from me, Thonk or direct from KRL-Bantry in the US. These are sold as equivalents to the old Tel Labs Q81 series.

For the Flanger and other projects that use a surface mounted temp co resistor I use the TE Connectivity +3900ppm/K part LT7339002A1K0JTE. It's available from various places including Farnell.

**Capacitors (Electrolytic)**

All the electrolytic capacitors (sometimes abbreviated to 'elect' in my parts lists) normally have a maximum DC working voltage of 35V, 50V or 63V. The suggested working voltage will be given in the parts list along with the capacitance which is measured in uF (microfarads).

Normally my modules use standard electrolytic devices – there is usually no need to get low ESR, low impedance types or extra stable ones unless it is especially mentioned in the parts list.

Generally speaking I would say that the more you pay for a capacitor the longer it is likely to last. You can get some very cheap parts from suppliers on Ebay but do keep your wits about you when using these services. If it sounds too good to be true then it probably is. Capacitors do have a limited lifespan compared to other electronic components but even the cheaper ones should last twenty years. Badly made ones, however, will fail very quickly.

All the electrolytic capacitors used in Oakley modules are radially mounted unless it specifically says so in the parts list. Radially mounted means that they are supplied as little plastic covered cylinders with the leads sticking out of one end. The boards are laid out to accommodate a pitch or lead spacing of 0.2" (5mm), but 0.1" (2.5mm) is the most common type of radial electrolytic capacitor and I use these types all the time. The benefit of using these smaller pitched capacitors is that the device sits just above the board surface allowing the water wash to work very well. Some of the bigger capacitors used in the power supply projects use larger lead spacings. The PSU, EPSU and RPSU projects, for example, use a 7.5mm lead spacing for the smoothing capacitors which gives better physical stability.

A lot of folk get a little confused with what voltage rating electrolytic capacitor they should buy. The suggested voltage rating is given on the parts list and although the values I have written down are technically correct they are sometimes not necessarily the easiest to find from your preferred supplier. So do not take the voltage rating in my parts lists as being the only value you can choose from. The voltage ratings are there for a guide only and many different values can be used with equal success.

No capacitor in any Oakley project will see a voltage higher than 30V. So you can be sure that if you buy a 35V capacitor it will not blow up and will work perfectly. However, purchasing a 35V 1uF capacitor is not that straightforward since radial 1uF electrolytic capacitors will typically only be available in values exceeding 50V. This is fine. Just buy the 50V or 63V version, it will work perfectly well and fit on the board with no problems.

But note I said 'fit on the board'. The higher the working voltage, for a given value of capacitance, the larger the physical size of the capacitor. So while a 1uF 63V may be a small device, a 220uF, 63V capacitor will be huge. With bigger values of capacitance you will need to be more careful with the voltage rating. Don't choose too big a voltage rating as the device may not fit on the board – it'll also be more expensive and large devices can also act as aerials in audio circuits picking up signals you don't want.

You maybe even more confused now about which voltage to choose. Don't worry it's actually very easy. There's a quick rule of thumb which will help you choose what you need:

**For small values of capacitors, for example, 1uF, 2.2uF & 4.7uF, then go for 50V or 63V devices. While for bigger values like 10uF, 22uF, 47uF and 100uF go for 35V.**

In special circumstances there may be other ratings you need to choose – like ripple current. In these cases I will make it very clear in the parts list. An example of this is the power supply modules where I even suggest the make and type of capacitor one should use.

**Capacitors (Ceramic)**

The low value (1pF to 1nF) through hole ceramic capacitors should be C0G ceramic plate or dipped multilayer ceramic capacitors. Another expression for C0G is low-K or NP0. C0G is a type of dielectric used in the capacitor and it determines many of the characteristics of the capacitor. C0G is a high quality dielectric and offers good stability, low temperature variation and low noise.

The lead spacing for the C0G ceramic caps on my PCBs is predominantly 2.5mm. However, on my older boards you may find it is the larger 5mm or 0.2". The project parts list will usually state if the device needed is a 2.5mm or 5mm fit. However, if it doesn't give any lead spacing at all, it's probably an older board, and you must buy a 5mm or 0.2" part.

For those boards that use surface mount components the parts list will make it clear when surface mount components need to be used. Most of the surface mount multi-layer ceramic capacitors will be the same size as the resistors, that is 0805 (or 2012 metric). If a different size, like the larger 1206, is needed it will be clearly indicated in the parts list. Because of their tiny size the voltage rating is usually much smaller than their through hole equivalent. Look for devices with DC working voltages of 25V or more. The capacitance tolerance should be +/- 5% or smaller.

Surface mount capacitors can sometimes be bought individually but more often than not you will need to buy them in fives or tens. Thankfully they are cheap parts.

No 0805 capacitor will have its value stamped onto its body so it is difficult to tell them apart. Take special care when placing them on the board and storing them to ensure you don't get the values mixed up. Generally, the larger values will be taller than the smaller values, but this is unlikely to help you tell the difference between a 820pF and 560pF device.

**Capacitors (Polyester)**

I use through hole metallised polyester film capacitors in my designs that need a good quality non polarised capacitor with values between 1nF and 2.2uF. These come in little plastic red, yellow, grey or blue boxes with short legs that stick out of the bottom. The ones we need always have a pitch spacing of 5mm (0.2"). Try to get ones with maximum DC operating voltages of 50V, 63V or 100V. Anything much higher than that will probably be too physically large. It is also possible to use the newer dipped multilayer C0G ceramics in place of the polyesters although these have yet to become widely available in values over 1nF in through hole packages.

**Capacitors (100nF Multi-layer Ceramics used for power supply decoupling)**

Most of my through hole PCBs require 100nF axial ceramics for the power supply decoupling. It doesn't matter whether these are bought as 50V or 63V as either will do. The PCB package shape for these devices has a lead spacing of 0.3” (7.5mm) which means the standard polyester box capacitor will not fit. There are a few different types of axial ceramic capacitors – the chief difference being their dielectric which then affects their price. The dielectric is the insulator used in the manufacture of the devices. There are the more expensive C0G types which have an excellent performance but the other cheaper types with X7R or Y5V dielectrics are perfectly good enough for our needs.

The projects that use surface mount capacitors use a 0805 (metric 2012) ceramic capacitor. These are not available in C0G but the X7R dielectric is good enough for power supply decoupling. Tolerance is not really important but +/- 5% is typical. They are available from various manufacturers. An example would be AVX's 08055C104JAT2A which is a 50V DC part.

**Integrated Circuits**

Most of the ICs I use in my 5U and rack projects are supplied as dual in line (DIL or DIP) packages. These through hole, as opposed to surface mount, parts are generally, but not always, suffixed with a CP or a CN in their part numbers. These are the traditionally shaped silicon chips that many of us are most familiar. They are typically 0.3" across and have pins, spaced at 0.1", running down each of the long sides.

Surface mounted parts (SMD or SMT) are much smaller in size and do not have pins that go through the board to the underside. They are soldered from the top side of the board and, like their names suggests, sit directly on the surface of the PCB. A through hole TL072ACP is not physically compatible with a surface mount TL072ACD, even though its the same circuit inside the package. Most of the ICs used will be in small outline (SO) narrow body packages. The TL072ACD being in an SO8, or SOIC8, package, the number eight representing how many pins the device has.

The parts list in the relevant project Builder's Guide will make it explicitly clear when you need to buy surface mount parts. If it doesn't mention surface mount in the parts list you can safely assume you will be using standard through hole parts.

Since the introduction of the RoHS (Restriction of Hazardous Substances) directive in 2004 most electronic components are only available without lead or cadmium. This is a good thing since both these materials are very toxic and too many electronic items were ending up in landfill. However, the part numbers of some ICs did change to reflect their new more environmentally friendly status. The ICs base number did not change, but often the suffix was altered or new letters added to the suffix. For example the LF398N became the LF398N/NOPB. The two parts in this case are functionally identical, the former has lead while the latter hasn't. NOPB meaning no lead or 'no Pb' with Pb being the chemical symbol for lead. My parts lists will often only give the IC's base number as either part may be used. It's worth reiterating that lead free parts can be soldered with either lead free or traditional tin/lead solders. But parts with lead should only be soldered with tin/lead solder. It makes no difference which solder you use if you are using an IC socket.

The through hole TL072C dual op-amp is probably the most used of any IC in my range of modules. Various manufacturers make it and it is available virtually everywhere. The TL072ACP is an improved version of it and, if the price is similar to the ordinary version, it is worthwhile using this one instead. Some modules may require the better ACP version and it will say this in the project's parts list.

The DG403 is an analogue switch. A variety of companies make this part, although Vishay-Siliconix is probably the most common version. The part you need is DG403DJ. We use this part on our Discontinuity, VC-LFO and D-LFO 5U modules and our SE330 rack project.

The 4558 dual bipolar op-amp is chosen for its increased output current capability. I use it in a few modules and it is a popular audio chip, but I would not recommend its use in all places where you need a dual op-amp. In the UK, Farnell and RS sell the little chap for peanuts. Various manufactures make the device, eg. MC4558CN and RC4558P.

The LM13700N is a dual operational transconductance amplifier. It is sometimes not found in the op-amp section of your parts catalogue but listed as a ‘special’ or under ‘OTA’. The LM13700 can usually, but not always, be substituted with the LM13600 (still available from JRC although not common in the UK) or the now defunct NE5517 with no loss of performance.

The THAT2180LC is used in our voltage controlled cores in the older ADSR envelope generators and the Noise/Filter module. THAT transistor arrays, THAT300P, 320P and 340P, are used in several of the modules. THAT Corporation parts are available from Farnell in Europe or direct from the manufacturer's main online distributor Profusionplc.com. Sadly THAT parts are not particularly cheap any more.

The 2164 quad VCA chip is a popular IC amongst the Synth-DIY and stompbox community. It was originally from Analog Devices and their version is called SSM2164. However, although these do still seem to be available from various places you may find it easier and cheaper to obtain the Coolaudio clone of it called the V2164D. This is available from various guitar effects shops but Mammoth Electronics in the US carry it at a very good price.

The Panasonic MN3207 bucket brigade delay IC can be had from most good online 'guitar effect' parts stores. You can also use Belling Lee's BL3207 or Coolaudio's V3207. Musikding.de are a recommended supplier for the V3207.

The AS3310 envelope generator chip used in the ASV module is available from Electric Druid, Banzai and Thonk.

**Transistors**

The BC550 and BC560 devices are discrete low noise NPN and PNP transistors respectively. They are 'European' types and are normally available from most online retailers including the smaller guitar effects builders' suppliers like Banzai and Bits Box. They are typically manufactured by either Fairchild, On-Semiconductor or NXP.

Quite often you see an A, B or C suffix used in their full part name, eg. BC550B. This letter depicts the gain or grade of the transistor (actually hfe range of the device). Oakley modules are usually designed to work with any grade device unless stated specifically in the parts list.

A BC550 can be substituted with a BC549 of any grade in an Oakley project. Like wise the BC560 can be substituted with a BC559. The only real difference between a BC550 and BC549 is the maximum operating voltage, Vce(max). Both devices have a Vce(max) that is greater than anything they will experience in any Oakley module.

Various manufacturers are rationalising their BC5XX product line at the moment. As such some suppliers are taking their time catching up. So if you find the BC550B suddenly not available try searching for a BC550C.

The surface mount version of the BC550 is the BC850, and of the BC560, the BC860.

My most commonly used JFET (junction field effect transistor) in the Oakley range is the J201. However, Fairchild, the original makers of this fine product have sadly deleted it from their stock in the standard through hole form. It is still available from them as a surface mount part but this will not fit most of the Oakley boards. Thankfully, both Linear Systems and InterFET are now producing the device in a variety of packages including the TO-92 through hole package. Mouser are selling the InterFET one and I normally have a small stock too. You may also find that some Ebay suppliers still have stock of the Fairchild part at a reasonable price. However, you should be aware that buying from Chinese suppliers does carry a risk of getting fake parts.

In the 5U 'One of three' VCO and ASV projects I use the J112 which is available at both Rapid, Farnell and many other places.

The SVCO has an option to use the classic Japanese FET the 2SK30A-GR. These excellent devices are no longer being made by the manufacturer but worldwide stocks are still very high. These are normally available from guitar effects places like Banzai and Musikding but can also be found on Ebay and Dalbani, the rare parts supplier. Issue 2 SVCO boards have an additional footprint to allow other FETs, like the J112, to be used.

## Diodes

The standard signal diode is the 1N4148. This is a very common part and is available pretty much everywhere. Alternatively you can use the 1N914 or 1N4448. The through hole 1N4148 is an axial component which means it is like a resistor in that the device is housed in a small cylindrical container with the leads sticking out each end. For the those boards that require the surface mount version, you need to find the 1N4148WS which is housed in a tiny SOD-323 package.

Another common diode I use is the BAT42. This is a Schottky diode which behaves differently at low voltages when compared to the 1N4148. It often comes in a package that looks identical to the 1N4148 but for the tiny writing on its side. The surface mount version is called the BAT42WS which has even smaller writing on its top.

My standard power diode is the through hole 1N4002. However, you can also use the 1N4003 or 1N4004. In most cases it should also be fine to use the 1N4001, but in the power supplies I would recommend the 1N4004 because of its higher voltage capability. You can get them with different lead diameters too, but it does not matter which one you get for Oakley projects.

The newer issues of the PSU and RPSU use a much beefier diode. The 1N5401. This device has a much larger body and lead diameter. It can really only be used where the board design, such as the later issue PSU board and RPSU, allows for the increased size.

Zener diodes are sometimes used in Oakley projects. These are different than ordinary diodes and should not be used in place of them. The through hole ones I use are 500mW types with axial leads. At first glance they look identical to 1N4148 signal diodes but they will have their reverse voltage rating, or a code representing the reverse voltage rating, written in small print on their sides.

Surface mount zener diodes are also used. Being smaller than their through hole counterparts the maximum power rating is only 300mW. Typical part numbers will start with BZX384-C and then the voltage rating, eg. BZX384-C5V1 which is a 5.1V device. The device size is typically the same as the other SMD diodes I use, that is SOD-323.

## Light Emitting Diodes

These are a standard part and available in most places. The biggest problem is choosing the right one from the bewildering array of parts on offer from the suppliers. Generally speaking buy the cheapest round diffused ones they sell and you'll probably get it right.

Rack mounted and eurorack modular projects typically use 3mm diameter LEDs, while our 5U modular projects use 5mm diameter LEDs.

Some LEDs can be bought with internal series resistor. These types normally have an operating voltage specified like 5V, 12V or 15V. You do not want these types. Instead get the ones with operating voltages that vary from 1.8V to 2.4V as these have no internal resistor.

Some of my modules use bi-colour LEDs. These have two different coloured LEDs in one clear or diffused package. Do not get tri-colour types as an alternative to bi-colour ones; these have three legs not two, and cannot be made to work in my circuits. For the bi-colour LEDs I prefer to use ‘red-green’ types, although other colours are available.

Only one module, the later issues of the 5U VC-LFO, uses a tri-colour LED. As stated above these have three legs not two and both LEDs can be lit simultaneously to create varying colours. A bi-colour LED cannot be used in place of a tri-colour LED. Again I prefer to use ‘red-green’ types, although other colours are available.

The 5U modules when they have need for an LED use 5mm round dome LEDs. The Schaeffer panels assume that you will be using these with a mounting lens clip. The LED clips I now use I get from Rapid which are described as '5mm low profile lenses'. They fit flush with the front panel and hold the LED very firmly. They also require a low profile lens clip. This holds both clip and LED securely to the front panel. Red LEDs should use a red clip, green LEDs should use a green clip and so on. For bi-colour and tri-colour LEDs, it is best to get an uncoloured or clear lens.

The ADR30, SRE330, and Eurorack modules use 3mm LEDs. These are usually mounted direct to the board. They normally require no LED clip to hold them in place.

**Pots (aka Potentiometers)**

Virtually all of my 5U and rack projects use the 16mm Alpha device. These are very much an industry standard part and are used in all sorts of gear, including most of the Doepfer modules. In my modules the right angled pots are usually attached to the PCB with metal pot brackets. The brackets are a stock part from Omeg Ltd here in the UK. However, I carry a large stock and sell them as pot bracket kits with the PCBs. I can also sell brackets individually as well on request. The ASV uses vertically mounted 16mm Alpha pots and does not need pot brackets.

Now this is where it gets complicated. Even if you buy 16mm Alpha or ALPS pots you still need to make sure you have the correct pot shaft. It is the shaft that the knob will fit onto. They come in three basic types; splined, round, and D-shaft. The knobs you will need to buy should then fit onto the shaft you have chosen. The D-shaft types are probably not going to be easy to find, although they are the most common in commercial mass produced applications because they are cheap and quick to fit. The most likely type you will see from the parts suppliers is the 6mm diameter splined shaft which work with low cost push fit knobs. The shaft is split down the middle so that the natural springiness of the metal holds the knob in place. Round types have perfectly smooth cylindrical shafts and are available in either 6mm or 1/4” (6.25mm) diameters. Push fit knobs are not available for round shafts and you need to purchase grub screw or collet knobs for these.

Grub screw knobs can also be sometimes used with splined shafts. However, you have to be very careful that you don't over tighten the screw otherwise the shaft can become distorted. I haven't found this to be a problem on the modular synthesiser projects. On those modules the grub screw tends to line up with the split in the splined shaft and thus makes a good contact with both halves of the shaft. However, on our rack modules this is not the case as the board sits horizontally so the grub screw will push onto one half of the shaft only and bend it out of

shape. It is therefore better to use push on knobs with my standalone rack projects if you are using pots with splined shafts.

Now just to make things really annoying, the shaft length also varies with vendor. In most cases a longer shaft can be simply cut down with a hack saw to the smaller lengths. It is a good idea to then use a file to round off any sharp edges especially if you are using push fit knobs. I strongly recommend that you cut and file the pot shafts down before you fit them to the board.

Almost all the 16mm pots come with a little metal tang that is supposed to locate into a small hole in the front panel. Once fitted into the hole the tang stops the pot from rotating if the nut is loose. However, with most of my Schaeffer panels, or any other flat panel, you will not need these little tangs. Indeed, they will actually stop the pot from seating correctly against the panel. You must therefore break them off before fitting them into the pot brackets or the PCBs. It's a simple job though with a decent pair of pliers or more sturdy wire cutters. Don't try to cut through the tab just bend it away from the pot and it will neatly snap off. If you are building an ASV and are using the Schaeffer panel design from my website then you should leave the tabs in place. The panel has been designed to accept the tabs by having small blind holes drilled into the flip side of the panel.

Banzai are in Germany, but deliver worldwide, sell 16mm Alpha pots and these are my own preferred choice of supplier. The pots come with a nice short shaft, in either 1/4” and 6mm diameters, so they don't need cutting down. Banzai also sell stereo (also called dual gang) pots which we use on some modules. They are the only European source of the 1K dual gang pot we use on the 5U Croglin filter module.

Rapid Electronics sell most, but not all, of the 16mm Alpha pots we need at a very good price. However, the Rapid pots have long 6mm splined shafts that need to be made shorter if you are using most styles of knobs. If the shaft is not shortened the knob will sit well above the panel surface which looks untidy. However, Rapid's 27mm matt black knobs can be used without cutting down the shaft.

Bits Box at www.bitsbox.co.uk looks a worthy supplier of all sorts of parts. And they have a good selection of the 16mm pots we need too.

Yet another supplier for pots in the UK is ESR Electronic Components Ltd. They have good prices and again offer all the values we need. The shaft length is of the longer variety though.

Das Musikding is always worth a look. Their stock isn't as big as Banzai but they can often be cheaper and quicker.

In the US there is Small Bear. An absolute gold mine of a place with more than just 16mm pots for you to purchase.

The new range of Eurorack projects use the Alpha 9mm series. The smaller size of the format requires a smaller pot and the vertically mounted version particularly allows very compact designs to be made. Thonk in the UK sell a good selection of Alpha 9mm pots with a variety of shaft types and diameters.

In the parts list you may find that the value of some of the pots is given as 47K. Your chosen supplier may not sell this value but instead offers 50K. This is perfectly acceptable as either value will do. Indeed, I sometimes use 50K in place of 47K in some parts lists and schematics and this does not indicate a preference to one value or the other. This small change in absolute value normally matters not. You will see it also with 22K and 25K, with 220K and 250K, and with 470K and 500K. Again these are relatively small differences and should not affect the operation of the circuit. Furthermore, if you were to measure the track resistance of most commercial grade pots you will normally find it to be out as much as 10% from the stated value on the body of the pot. So the accuracy of any pot's overall track resistance should not be relied upon.

One last thing to mention about the far eastern pots is that they use a different nomenclature compared to many of the older European designs. Like most engineers in the UK I called a linear taper pot A-type and a logarithmic taper pot B-type. The Alpha pots, like the original Japanese ALPS pots they've copied, are labelled the opposite way around. A is 'audio' or log taper, and B is linear. I have tried to ensure that I don't use either nomenclature in my newer documentation and stick with the words 'linear' or 'logarithmic' – often shown as LIN and LOG on the schematic respectively.

**Trimmers**

When I was a lot younger the standard term for this device was preset, but I think trimmer is pretty much universal now.

I use three basic types in Oakley projects, the multiturn cermet, the standard horizontal and the 6mm horizontal.

The **multiturn** trimmers are the ones that have the adjustment on the top of the box. Vishay and Bourns make these. Some types are 20 turns, while others are 25 turns. Either will do. They should have three pins that are in a line at 0.1" pitch. I generally use the Bourns 3296W series.

The **horizontal** types are traditional sealed carbon units. These are adjusted from the top and, as such, are called horizontally mounted or vertically adjusted. Piher and other companies make suitable types. Lead spacing is 0.2" for the track ends, and the wiper is 0.4” away. Rapid, Farnell and RS sell these parts at reasonable cost. You can use the more expensive cermet types that fit this footprint, such as Bourns 3386G, if you wish, but stability is not critical for any Oakley application that uses these trimmers.

The **6mm** trimmers I specify are actually sealed, or semi-sealed, cermet 3/8" square units with a smaller footprint than the traditional horizontal types. Like the others they are adjusted from the top and, as such, are called horizontally mounted types. Lead spacing is 0.2" (5mm) for the track ends, and the wiper is 0.2" (5mm) away. On my older board designs (2017 and earlier) the lead hole size is suited for all types of 6mm trimmers including the ones with clip in leads. My later boards, however, have a much smaller hole size and are only suitable for the sealed cermet Bourns 3386F and their cheap and cheerful equivalents like the Suntan WR3386F. The '6mm' moniker is now outdated with regards to my projects. There are 6mm trimmers but

these open frame cermet trimmers have largely been superseded by the semi-sealed 3/8" units. Newer Builder's Guides will refer to these parts as 3/8" trimmers.

**Switches**

What type of switch is very much up to you on most of the 5U modules. The switches are not attached to the PCB so can be any sort for the most part. The ones I use are the Series 5000 by APEM in France, and have a flat toggle. Farnell sell them and their part numbers can be found at the rear of this guide.

The ASV uses vertically mounted switches. I use the Gemini series made by TE Connectivity. Other manufacturers may have equivalents but I have not tried these. The TE part numbers are:

| | |
|---|---|
| SPDT on-on | A101SYCQ04 or A101SYCB04 |
| SPDT on-off-on | A103SYCQ04 or A103SYCB04 |
| DPDT on-on | A201SYCQ04 or A201SYCB04 |

You'll notice that each switch type has two different part numbers. The part numbers differ only in the third from last digit. B is a low voltage part while Q is a higher voltage part. For our application either may be used, so simply buy the cheapest available.

For our newer Eurorack designs I use the sub-miniature toggle switches with pins spaced at 2.54mm (0.1") apart. C&K make a good selection, but Taiwan's Dailywell company produce ones that are considerably cheaper and have only slightly worse longevity. Dailywell switches are available from Thonk as DW1 (on-on) and DW2 (on-off-on).

The SRE330, ADR30, and formerly the TM3030, Filtrex, SE330 and HVM, also use PCB mounted switches but these are right angled types and the toggle goes up and down when the board is laid flat and facing you. The switches are available with either metal or plastic bushes. I prefer the metal ones simply for aesthetic reasons.

The switches for the rack projects I use are made by Multicomp. The manufacturer's part numbers are:

| | |
|---|---|
| SPDT on-on | 1MS1T2B4M7RE |
| SPDT on-off-on | 1MS3T2B4M7RE |
| DPDT on-on | 1MD1T2B4M7RE |

PCB mounted switches as used on the Eurorack modules and the rack projects are very much preferred over wired types. It keeps the module together when it is not in the front panel and reduces the chances of wiring errors.

**Ferrite Beads**

Most boards are fitted with leaded ferrite beads, usually labelled L1 and L2 on the circuit diagrams. These are little axial components that look like little blackened resistors. They are

available from most of the mail order suppliers including Rapid and Farnell. Find them in the EMC or Inductor section of the catalogues.

**Heatsinks**

The TO-220 clip on heatsinks for the, now discontinued, Filtrex can bought from a variety of places. I rather like the little 21 deg C/W ones by Fischer Electronik. Their part number is FK237 SA220 O. Farnell sell them.

**Jumper Interconnects**

The multiway jumper interconnects are sometimes used on projects that use more than one circuit board. They are used to transport signals from one board in the module to another. They are a one piece assembly bought ready made from several places including Farnell. They are flat grey plastic covered strips that have a number of multistrand conductors arranged 2.54mm apart. They come with their conductors pre-stripped and often pre-tinned with solder too. The jumpers can be bought in a variety of different widths and lengths. 2” or 55mm is just the right length to get from the main board to the pot boards in our double width 5U high projects. Fewer conductors can simply be obtained by cutting the wider versions down with a knife or pair of scissors. That is, a six way conductor can be made from an eight way one by chopping the last two strips off.

**Fixed 0.1'' Interconnects**

The fixed 2.54mm interconnects that are used on the ASV and Eurorack modules are in two parts, the male header and the female socket or receptacle. I use interconnects in ten way, six way, and four way single in line (SIL) connectors. The ones I use in my builds are made by Multicomp, although more expensive types are available which may offer increased longevity. These are the Multicomp part numbers for the parts I used:

| | |
|---|---|
| 10 way socket | 2212S-10SG-85 |
| 10 way header | 2211S-10G |
| | |
| 6 way socket | 2212S-06SG-85 |
| 6 way header | 2211S-06G |
| | |
| 4 way socket | 2212S-04SG-85 |
| 4 way header | 2211S-04G |

**Flexible 0.1'' interconnects**

For the wired 0.1" (2.54mm) interconnections between the various boards within a module I use the either the 26 awg MTA parts, or Molex KK or their equivalents.

The MTA parts are made by Amp which are now part of the TE Connectivity (formerly Tyco) group. To use these effectively you need a special insertion tool to poke the wires into the special ‘housings’. The housing contains specially shaped contacts that cut through the insulation of the wire so you don’t need to do any stripping. Just simply push down on the wire with the tool to lock it into place in the housing.

The Molex KK strip and crimp system, and its ilk, is actually cheaper to purchase although it is perhaps not as quick to use. They use simple plastic housings that hold the individual crimps with one crimp being used per wire end. The crimps are normally bought in reels, but some places sell them individually. The crimping tool, that attaches the stripped end of the wire to the crimp, can be quite expensive if you don't shop around. However, they are not nearly as expensive at the MTA insertion tool. With the exception of the bigger 0.156" MTA power cables I always use Molex KK connectors. There is a lot more information about these parts in our Construction Guide.

**Wire**

I typically use 7/0.2 insulated multi-strand wire for all my general audio and low current interconnections. This can be bought in a variety of different colours and will work well with 2.54mm Molex KK housings and crimps.

If you do need to solder wire to direct to the board I recommend that you use wire no bigger than 7/0.2. I also recommend that the bare end is tinned with solder before soldering it into the board. Doing so prevents the need to excessively heat the wire to make any solder flow into the wire and across and into the PCB's solder pad. Excessive heat will lift solder pads (de-lamination) and trying to solder old wire which hasn't been pre-tinned may damage the board.

For higher current connections, like power cables and such like, I prefer to use 24/0.2 insulated multi-strand wire. This heavier gauge wire cannot normally be soldered direct to the board and use of screw terminals or Faston blades are recommended.

**Sockets**

For 1/4” sockets used on all of my 5U modules I recommend the Switchcraft 112APCX. These high quality parts are also used on the Moog and MOTM modulars. The PC part in the part number suffix means 'printed circuit' mounting, while the X denotes the RoHS friendly lead free compliance. Both Mouser and Rapid sell them at a reasonable price if you buy enough of them. Buying them singly is an expensive business.

Rapid also sell a Far Eastern clone of the 112APCX part that is considerably cheaper, but doesn’t look as nice. Actually, the socket itself seems fine but the mounting nut is a bit cheap. These sockets were made by Lih Sheng Precision in Taiwan. However, Rapid's part, even though their part number hasn't changed, seems to be now made by someone else in mainland China. Some 5U manufacturers are using the Lih Sheng part.

Please note that the standard Switchcraft 112A will not fit into our socket boards as it has solder tags. However, the 112A is a great socket for hand wired modules like the Overdrive and the 5U Ring Modulator

For the 3.5mm sockets used on my newer Eurorack modules the Thonkiconn socket is specified. These are available from Thonk or from other places as part number PJ398SM. Do make sure you also purchase the nut and flat washer separately if they are not supplied with the socket.

***Tony Allgood at Oakley Sound***

Cumbria, UK

# Preferred Parts Numbers for UK buyers

| Part Name | | Rapid | Farnell | Mouser |
|---|---|---|---|---|
| **Through Hole Resistors** | | | | |
| 0R82, 2W | | | 1219198 | |
| 2R2, 3W | | | 1900124 | |
| 1% Metal Film: | | | | |
| 22R | | 62-0724 | | |
| 75R | | 62-0752 | | |
| 100R | | 62-0762 | | |
| 110R | | 62-0763 | | |
| 150R | | 62-0767 | | |
| 220R | | 62-3434 | | |
| 330R | | 62-0792 | | |
| 680R | | 62-3446 | | |
| 1K | | 62-3450 | | |
| 2K | | 62-0844 | | |
| 2K2 | | 62-3458 | | |
| 2K7 | | 62-0852 | | |
| 3K6 | | 62-0894 | | |
| 3K9 | | 62-3461 | | |
| 4K7 | | 62-0862 | | |
| 5K1 | | 62-0864 | | |
| 6K2 | | 62-3466 | | |
| 6K8 | | 62-3467 | | |
| 8K2 | | 62-0882 | | |
| 10K | | 62-3474 | | |
| 10K | 0.1% (singles) | 63-1448 | | |
| 11K | | 62-3475 | | |
| 12K | | 62-3476 | | |
| 15K | | 62-3478 | | |
| 16K | | 62-3479 | | |
| 19K6 | 0.1% (singles) | 63-1506 | | |
| 20K | 0.1% (singles) | 63-1508 | | |
| 20K | | 62-3481 | | |
| 22K | | 62-3482 | | |
| 22K | 0.1% (singles) | 63-1516 | | |
| 27K | | 62-3484 | | |
| 30K | | 62-3485 | | |
| 33K | | 62-3486 | | |
| 36K | | 62-3487 | | |
| 43K | | 62-3489 | | |
| 47K | | 62-3490 | | |
| 51K | | 62-0944 | | |
| 56K | | 62-0947 | | |
| 68K | | 62-3494 | | |
| 75K | | 62-0954 | | |
| 100K | | 62-3498 | | |
| 100K | 0.1% (singles) | 63-1658 | | |
| 120K | | 62-3500 | | |
| 150K | | 62-3502 | | |

| | | | | |
|---|---|---|---|---|
| 200K | 0.1% (singles) | 63-1718 | | |
| 220K | | 62-0984 | | |
| 300K | | 62-0989 | | |
| 330K | | 62-3510 | | |
| 470K | | 62-3513 | | |
| 560K | | 62-1002 | | |
| 680K | | 62-3517 | | |
| 910K | | 62-1009 | | |
| 1M | | 62-1012 | | |
| 10M | | | 336907 | |
| 100K x 4 SIL (5P) network | | 63-0280 | 9356070 | |
| 100K x 8 SIL (9P) network | | 63-0245 | 9356827 | |
| 220K x 8 SIL (9P) network | | | 9356932 | |

**Surface Mount Resistors**

| | |
|---|---|
| 22R | 71-CRCW080522R0FKEAC |
| 100R | 71-CRCW0805100RFKEAC |
| 220R | 71-CRCW0805220RFKEA |
| 510R | 71-CRCW0805510RFKEA |
| 680R | 71-CRCW0805680RFKEAC |
| 1K | 71-CRCW08051K00FKEAC |
| 4K7 | 71-CRCW08054K70FKEAC |
| 22K | 71-CRCW080522K0FKEAC |
| 33K | 71-CRCW0805-33K-E3 |
| 100K | 71-CRCW0805-100K-E3 |
| | 652-CR0805FX-1003ELF |
| 110K | 71-CRCW0805110KFKEAC |
| 200K | 71-CRCW0805-200K-E3 |
| 220K | 71-CRCW0805220KFKEA |
| 240K | 71-CRCW0805240KFKEA |
| 270K | 71-CRCW0805270KFKEB |
| 510K | 71-CRCW0805-510K-E3 |
| 560K | 652-CR0805FX-5603ELF |

**Through Hole Capacitors**

| | | | |
|---|---|---|---|
| 100nF axial ceramic | 11-3560 | 1100417 | |

All 2.5mm and 5mm ceramic capacitors should be C0G or NP0.

| | | | |
|---|---|---|---|
| 10pF ceramic 2.5mm | 11-3426 | | |
| 15pF ceramic 2.5mm | 11-3401 | | |
| 18pF ceramic 2.5mm | 11-3402 | | |
| 22pF ceramic 2.5mm | 11-3427 | 1216407 | |
| 33pF ceramic 2.5mm | 11-3428 | 1216408 | 594-K330J15C0GF5TL2 |
| 47pF ceramic 2.5mm | 11-3429 | | |
| 56pF ceramic 2.5mm | 11-3405 | | |
| 100pF ceramic 2.5mm | 11-3430 | 1216416 | |
| 150pF ceramic 2.5mm | 11-3409 | | |
| 220pF ceramic 2.5mm | 11-3431 | | |
| 330pF ceramic 2.5mm | 11-3432 | 1216419 | |
| 390pF ceramic 2.5mm | | | |
| 470pF ceramic 2.5mm | 11-3433 | 1216420 | |

| | | | |
|---|---|---|---|
| 680pF ceramic 2.5mm | 11-3412 | | |
| 1nF ceramic 2.5mm | | 1216421 | |
| | | | |
| 4p7 ceramic 5mm | | 303379 | |
| 10pF ceramic 5mm | | | |
| 18pF ceramic 5mm | | 303446 | |
| 22pF ceramic 5mm | | | |
| 33pF ceramic 5mm | | 1216412 | |
| 47pF ceramic 5mm | | | |
| 150pF ceramic 5mm | | | |
| 100pF ceramic 5mm | | 1216414 | |
| 220pF ceramic 5mm | | 1216415 | |
| 330pF ceramic 5mm | | 1100509 | |
| 470pF ceramic 5mm | | 1100510 | |
| | | | |
| 1nF polyester | 10-3240 | 2429343 | |
| 1n5 polyester | 10-3242 | | |
| 2n2 polyester | 10-3244 | | |
| 3n3 polyester | 10-3246 | | |
| 4n7 polyester | 10-3248 | 9752935 | |
| 6n8 polyester | | 9752943 | |
| 10nF polyester | 10-2204 | | |
| | 10-3250 | | |
| 15nF polyester | 10-3252 | | |
| 22nF polyester | 10-2208 | 1890131 | |
| 33nF polyester | 10-3256 | | |
| 47nF polyester | 10-2212 | | |
| 68nF polyester | 10-2214 | | |
| 100nF polyester | 10-2216 | 1006030 | 80-R82DC3100AA50J |
| | | 2429342 | |
| 150nF polyester | 10-3262 | | |
| 220nF polyester | 10-2220 | 9750894 | |
| 330nF polyester | 10-2222 | | |
| 470nF polyester | 10-2224 | | |
| 680nF polyester | 10-3270 | 1166042 | |
| 1uF polyester | 10-2228 | 1006040 | |
| | | 2429346 | |
| 1u5 polyester | | 1679410 | |
| 2u2 polyester | 10-2200 | 1679398 | |
| | | | |
| 1nF polypropylene | 10-1430 | | |
| 6n8 polypropylene | 10-1455 | | 505-FKP2C016801DJI00 |
| 10nF 100V polypropylene | 10-1460 | | |
| 10nF 63V polypropylene | | 1890175 | |
| | | | |
| 1nF 1% polystyrene | | 9520236 | |
| 2.2nF 1% polystyrene | | 9520244 | |
| 10nF 1% polystyrene | | 9520830 | |
| | | | |
| 1uF electrolytic | 11-1280 | | 710-860010672005 |
| 2u2 electrolytic | 11-2928 | 9692894 | 710-860020672006 |
| 2u2 electrolytic (low profile) | | 8766797 | |
| 4u7 electrolytic | 11-3932 | | 710-860010672008 |
| 10uF electrolytic | 11-3933 | 2805535 | |
| 22uF electrolytic | 11-3934 | | 710-860240572002 |
| 22uF electrolytic (low profile) | | 8766835 | |
| 47uF electrolytic | 11-3936 | | |

| | | | |
|---|---|---|---|
| 470uF 35V radial elect | | 1848452 | (Euro PSU) |
| 470uF 50V radial elect | | 2841894 | (RPSU/ADR30) |
| 1000uF 35V radial elect | 11-0760 | | |
| 1000uF 50V radial elect | 11-3938 | | (RPSU/SRE330) |
| 1800uF 35V radial elect | | 9692339 | (PSU issue 3 & 4) |
| 1800uF 35V radial elect | | 1744973 | (Euro PSU) |
| 1800uF 50V radial elect | | 2750225 | (PSU2 issue 1) |

**Surface Mount Capacitors**

| | | | |
|---|---|---|---|
| 33pF C0G ceramic | | | 80-C0805C330J5G |
| | | | 710-885012007079 |
| 470pF C0G ceramic | | | 77-VJ0805A471JXBCBC |
| 1nF C0G ceramic | | | 80-C0805C102J5G7210 |
| 47nF C0G ceramic | | | 80-C0805C473J3GECTU |
| 1uF/25V X7R ceramic | | | 80-C0805X105K3R3316 |

**3mm LEDs**

| | | | |
|---|---|---|---|
| Green | 55-0105 | | 859-LTL-2231AT |
| Red | 55-0150 | | |
| Yellow | 55-0110 | | |
| Bi-colour red/green | 56-0600 | | |

**5mm LEDs**

| | | | |
|---|---|---|---|
| Green | 55-0120 | | |
| Red | 55-0155 | | |
| Yellow | 55-0125 | | |
| Orange | 55-0124 | 1142516 | |
| Bi-colour | 55-0172 | | |
| Tri-colour | 56-0685 | | |
| Low profile green lens | 55-0960 | | |
| Low profile yellow lens | 55-0965 | | |
| Low profile red lens | 55-0950 | 1175500 | |
| Low profile clear lens | 55-0970 | 1175504 | |
| Lens clip | 55-0975 | | |

**Discrete Semiconductors**

| | | | |
|---|---|---|---|
| BC182L | 81-0034 | | |
| BC212L | 81-0044 | | |
| BC549B | 81-0068 | | |
| BC549C | 50-0298 | | |
| | 81-0441 | | |
| BC550B | | 1467880 | |
| BC559C | 50-0301 | | |
| | 81-0442 | | |
| BC560C | | 1467886 | |
| BC850C | | | 863-BC850CLT1G |

| | | | |
|---|---|---|---|
| J201 | | | 106-J201 |
| J112 | 47-0366 | 1017712 | |
| | | | |
| TIP35C | | 9294350 | |
| TIP145 | | 9294562 | |
| TIP147 | 81-0913 | | |
| | | | |
| BAT-42 | 47-3102 | 9801430 | 625-BAT42 |
| 1N4148 | 47-3416 | | |
| 1N4004 | | 9556109 | |
| 1N5401 | | 2533161 | |
| 1N5819 | 47-2566 | 9801219 | 511-1N5819 |
| | | | |
| 1N4148WS (SMD) | | | 512-1N4148WS |
| | | | |
| 2V7 zener | 47-3000 | | |
| 3V6 zener | 47-3006 | | |
| 5V1 zener | 47-3014 | | |
| 5V6 zener | 47-3016 | | |
| 8V2 zener | 47-3024 | | |
| 10V zener | 47-3028 | | |
| 12V zener | 47-3032 | | |

**Integrated Semiconductors (ICs)**

**4000 series CMOS:**

| | | | |
|---|---|---|---|
| 4001B | 83-0316 | | |
| 40011BM (SMD) | | | 595-CD4001BM96 |
| 4011B | 83-0328 | | |
| 4013B | 83-0332 | | |
| 4016B | 83-0338 | | |
| 4049UB | 83-0380 | | |
| 4049UBD (SMD) | | | 595-CD4049UBD |
| 4050B | 83-0382 | | |
| 4051B | 83-0384 | | |
| 4052B | | 1014041 | |
| 4052B (SMD) | | | 595-CD4052BNSR |
| 4066 | 83-0392 | | |
| 4093B | 83-0420 | | |
| 4104 | | 385890 | |

**Opto-couplers:**

| | | | |
|---|---|---|---|
| 6N137 | | 2453244 | |
| 6N139 | | 1021341 | |

**74 series logic:**

| | | | |
|---|---|---|---|
| 74HC04 | | 9590951 | |
| | | | |
| 74HC00D (SMD) | | | 595-SN74HC00DR |
| 74HC02D (SMD) | | | 595-SN74HC02DR |
| 74HC14D (SMD) | | | 595-SN74HC14D |
| 74HC74D (SMD) | | | 595-SN74HC74D |
| 74HC4053D (SMD) | | | 757-74HC4053D |

**Power ICs:**

| | | | |
|---|---|---|---|
| 78L05 | 47-3278 | 9489444 | |
| 78L09 | | 2532896 | |
| 7812 | | 9490280 | |
| 7815 | 47-3295 | | |
| 79L05 | 47-3284 | | |
| 7906 | | 1013824 | |
| 79L12 | | 9666176 | |
| 7915 | 47-3301 | | |
| LM317T | 47-3318 | 1652293 | |
| LM337T | 47-3328 | 1211104 | |
| MC78M05 | | 9665374 | |
| OKI-78SR-5/1.5-W36-C | | 2102101 | |

**Voltage References:**

| | | | |
|---|---|---|---|
| LM329DZ | | 9488510 | |
| LM336Z-5 | | 9488502 | |
| LM4040-5.0V | | 9485970 | 926-LM4040DIZ50NOPB |
| LM4040-10V | | 1673984 | 926-LM4040DIZ100NOPB |
| REF02 | | 1079390 | |

**Transistor arrays:**

| | | | |
|---|---|---|---|
| SSM2220 | | 9605096 | |
| THAT300P | | 1354175 | |
| THAT340P | | 1354180 | |
| BCM847DS (SMD) | | | 771-BCM847DS135 |
| BCM847DS (SMD) | | | 771-BCM857DS135 |

**Op-amps:**

| | | | |
|---|---|---|---|
| 4558 | 82-0716 | 1106010 | |
| AD712 | | 9604898 | |
| CA3140 | 82-0686 | | |
| LF412CP | 82-5048 | 2292099 | |
| LF412CD (SMD) | | | 595-LF412CDR |
| LM358 (replaces AN6562) | | 1459520 | |
| LM1458 or MC1458 | | 9486852 | |
| | | 1103044 | |
| LT1013CP | | 1470376 | |
| NE5532 | | 1106091 | |
| OP177GPZ | | 9604685 | |
| OP275GP | | 9603760 | |
| OPA2134 | | 1097574 | |
| OPA2277 (see also LT1013) | | 1459562 | |
| TL072 | 82-0050 | | |
| TL072ACP | | 1103005 | |
| TL072ACD (SMD) | | | 595-TL072ACD |
| TL074 | 82-0054 | | |
| TL074ACN | | 1105902 | |
| TL074CDR (SMD) | | | 595-TL074CDR |

**Special (analogue switches, OTAs, VCAs, comparators):**

| | | | |
|---|---|---|---|
| DG202BDY (SMD) | | | 781-DG202BDY-E3 |
| DG403DJ | | 1077116 | |
| LM13700 | | 1651866 | 926-LM13700N/NOPB |
| LM311 | 82-0208 | | |
| LF398N/NOPB | | 2496205 | |
| LM2901 | | 2292828 | |
| LM2903 | 82-0842 | 9487638 | |
| THAT2180LC | | 1354168 | |

**Alpha Pots**

See main text for more information.

| | | | |
|---|---|---|---|
| 10K lin Alpha 16mm | 65-0715 | | |
| 47K lin Alpha 16mm | 65-0725 | | |
| 250K log Alpha 16mm | | | 313-1530F-250K |
| 1M log Alpha 16mm | 65-0845 | | |

**Trimmers**

| | | | |
|---|---|---|---|
| 500R m/t cermet | | 9353283 | |
| 1K m/t cermet | 68-0315 | | |
| 2K m/t cermet | 68-0320 | | |
| 5K m/t cermet | 68-0325 | | 652-3296W-1-502LF |
| 10K m/t cermet | 68-0330 | | 652-3296W-1-103LF |
| 20K m/t cermet | 68-0335 | 1141406 | |
| 50K m/t cermet | 68-0340 | 9353305 | |
| 100K m/t cermet | 68-0345 | 9353194 | |
| | | 1141408 | |
| 200K m/t cermet | 68-0350 | | |
| 1M m/t cermet | 68-0360 | | |

| | | | |
|---|---|---|---|
| 500R 6mm | | 9354689 | |
| 1K 6mm | 68-0566 | | |
| 2K 6mm | | 9354620 | |
| 5K 6mm | 68-0570 | | |
| 10K 6mm | 68-0572 | | |
| 20K 6mm | 68-0574 | 9354646 | |
| 50K 6mm | 68-0576 | 9354719 | |
| 100K 6mm | 68-0578 | 9354573 | |

| | | | |
|---|---|---|---|
| 1K horiz | 67-0215 | | |
| 2K2 horiz | 67-0220 | | |
| 10K horiz | 67-0230 | | |
| 22K horiz | 67-0235 | | |
| 47K horiz | 67-0240 | | |
| 100K horiz | 67-0245 | 1227542 | |
| 470K horiz | 67-0255 | | |
| 1M horiz | 67-0260 | | |

**IC Sockets**

| | | | |
|---|---|---|---|
| 8-pin DIL | 22-1720 | | |
| 14-pin DIL | 22-1721 | | |
| 16-pin DIL | 22-1722 | | |
| 18-pin DIL | 22-1723 | | |
| 28-pin skinny DIL | 22-1726 | | |
| 20-pin SIL | 22-1750 | | |

**Heatsinks**

| | | | |
|---|---|---|---|
| TV35 7.2 degC/W | 36-0196 | | |
| TO-220 clip on (Filtrex) | | 4621141 | |
| TO-220 mounting kit | | 522636 | |

**Interconnects**

| | | | |
|---|---|---|---|
| 4-way terminal block | 21-0116 | | |
| Keystone 8191 | | 2579832 | 534-8191 |
| 2-way jumpers | 22-0692 | | |
| Faston 250 single terminal blade | | 2506365<br>1701613 | |
| 4 way 0.156” MTA hdr (MOTM power) | | 589068 | 571-6404454 |
| 4 way 0.156” MTA cover | | 589007 | |
| 4 way 0.156” MTA hsg (18awg) | | 1772854 | |
| 4 way 0.156” MTA hsg (24/0.2 wire) | | 1098462 | |
| 6 way 0.100 MTA hdr (MU power) | | 588611 | |
| 5-way 0.156” MLX hdr | 22-2605 | | |
| 5-way 0.156 MLX hsg | 22-2515 | | |
| 2 way 0.1” MTA hdr | | 588570 | |
| 3-way 0.1” MTA hdr | | 588581 | |
| 4-way 0.1” MTA hdr | | 588593 | |
| 5-way 0.1” MTA hdr | | 588600 | |
| 6-way 0.1” MTA hdr | | 588611 | |
| 2-way 0.1” MTA hsg | | 1098459 | |
| 3-way 0.1” MTA hsg | | 1098438 | |
| 4-way 0.1” MTA hsg | | 1098455 | |
| 5-way 0.1” MTA hsg | | 1098439 | |
| 6-way 0.1” MTA hsg | | 1098456 | |
| 0.1” 2-way MLX hdr | 22-0838 | 9731148 | |
| 0.1” 3-way MLX hdr | 22-0840 | 9731156 | |
| 0.1” 4-way MLX hdr | 22-0842 | 9731164 | |
| 0.1” 5-way MLX hdr | 22-0844 | | |
| 0.1” 6-way MLX hdr | 22-0846 | | |
| 0.1” 8-way MLX hdr | 22-0848 | 9731180 | |
| 0.1” 2-way MLX hsg | 22-0820 | 143126 | |

| | | | |
|---|---|---|---|
| 0.1” 3-way MLX hsg | 22-0910 | 143127 | |
| 0.1” 4-way MLX hsg | 22-0915 | 143128 | |
| 0.1” 5-way MLX hsg | 22-0920 | | |
| 0.1” 6-way MLX hsg | 22-0925 | | |
| 0.1” 8-way MLX hsg | 22-0930 | | |
| | | | |
| 10 way IDC box header | | 1642019 | |
| 16 way IDC box header | 19-0510 | 1642020 | |
| | | | |
| 10 way IDC plug | | 1642027 | |
| 16 way IDC plug | | 1642028 | |
| | | | |
| 10 way SIL socket | | 1593464 | |
| 10 way SIL header | | 1593417 | |

**Mains Wiring**

| | | | |
|---|---|---|---|
| Three way WAGO block | | 1891600 | |
| IEC receptacle | | 1176790 | |

**Sockets & Plugs**

| | | | |
|---|---|---|---|
| 1/4” 112APC socket | 20-1430 | 1192839 | 502-112APCX |
| 1/4” Chinese Neutrik plug | 20-2183 | | |
| 5-pin socket (midi) | 20-0314 | | |

**Miscellaneous**

| | | | |
|---|---|---|---|
| Ferrites | 26-4860 | 9526820 | 81-BL01RN1A1F1J |
| 4MHz Xtal | 90-1074 | 1368786 | |
| Cable ties (pack of 100) | 04-0631 | | |
| 20mm PCB fuseholder | 26-0165 | 2461158 | |
| Cable grommet | 04-0275 | | |
| 11mm hex M-F spacer | | 1651698 | |

**Switches**

| | | |
|---|---|---|
| DIL SW (4-way) | 80-0304 | 9471570 |
| DPST power switch | | 1634648 |

*Modular 5U (boards mounted at right angles to panel):*

| | |
|---|---|
| SPDT toggle (on-on) | 1082301 |
| SPDT toggle (on-off-on) | 1082308 |
| SPDT toggle (mom-off-mom) | 1082303 |
| DPDT toggle (on-on) | 1082315 |

*Modular 5U (boards mounted parallel to panel):*

| | |
|---|---|
| SPDT on-on | 2292959 |
| SPDT on-off-on | 1197676 |
| DPDT on-on | 1197677 |

*Rack projects (eg. ADR30, SRE330 and HVM):*

| | |
|---|---|
| SPDT PCB mount (on-on) | 9473297 |
| SPDT PCB mount (on-off-on) | 9473300 |
| DPDT PCB mount (on-on) | 9473319 |

*Euro modules (boards mounted at right angles to panel):*

| | |
|---|---|
| DPDT PCB mount on-on | 9473270 |