

Kanga Whisper Mite Dual band



Kanga Whisper Mite WSPR/QRSS Transmitter Kit

The Kanga Whisper Mite (KWM) is an inexpensive, easy-to-use way to explore low-power WSPR (Weak Signal Propagation Reporter) operation and QRSS slow CW beaconing. Once configured it runs standalone — no PC required — and needs only a simple wire antenna and a 5 V DC supply (phone charger or battery pack) to get on the air.



Key Features

- Standalone operation — configure via the rear USB socket once, then the KWM runs independently. Internal Switch to Lock the configuration so it can't be changed by accident in the field.
- Compact, runs from a 5 V supply and delivers about 200 mW (user adjustable)
- Simple configuration, set and never change again (unless you want to!) — set Band 1, Band 2, or dual-band using an easy serial menu (link to a suitable free terminal emulator on the Kanga Whisper Mite web page).
- Precise timing — built-in RTC with TXCO and battery backup keeps accurate time; a single front-panel Sync button aligns the unit quickly.
- Real results — low power plus a basic end-fed half-wave antenna often yields spots thousands of kilometres away.

Technical notes

- WSPR requires tight frequency and timing stability. The KWM is designed to meet the mode's requirements: frequency drift is well controlled and transmissions start precisely on even-minute boundaries. QRSS mode gives a wide range of patterns and QRSS features.
- Typical reports show drift factors of 0 !
- Use a simple wire antenna and as clean a DC supply as practical to minimise interference and possible frequency shift.



Getting on the air

1. Connect the KWM to your PC via the USB socket and open the serial terminal.
2. Configure callsign, locator, power and Frequency for WSPR and your choice of QRSS setting if using that mode through the menu.
3. Disconnect the PC, connect a 5 V supply and your antenna, press the Sync button if you to align time to an even minute start, then let the KWM run.

Build and support

- The kit is straightforward to assemble if you follow the step-by-step instructions.
- If you need help with setup or tuning, check the documentation on the product page or drop a note to Kanga support.

Build it, sync it, and enjoy watching a few hundred milliwatts travel thousands of miles.

“Why only 200mW, that’s not much power” I hear you say.

Quick answer

WSPR network is vastly more sensitive than SSB — roughly 30–35 dB in practical comparisons. That means a WSPR transmitter can be thousands of times lower in power than SSB and still be decoded at the same distance.

Rule of thumb and a worked example

- Typical SSB intelligibility target is about +6 dB SNR in a 2.5 kHz receiver bandwidth; WSPR decoders can work down near –28 dB SNR referenced to a 2.5 kHz bandwidth.
- Difference $\approx 6 - (-28) \approx 34$ dB. $34 \text{ dB} \approx \text{factor } 10^{(34/10)} \approx 2,500$ in power. This is the rough power ratio between SSB and WSPR for comparable detectability under the same antennas and path conditions.

Worked example:

- If a WSPR beacon is running 0.2 W (200 mW), an equivalent SSB transmit power giving similar chance of being heard at the same stations would be $\sim 0.2 \text{ W} \times 2,500 \approx 500 \text{ W}$.

Maybe 200mW isn’t that low power after all!

Many operators wouldn’t dream of running 200mW, 10-50mW will get good reports. Try it yourself.

QRSS is similar with a world wide network of receivers on line.

Let's build our Whisper Mite

First job, check the parts list.

Parts list

Case (split in to two half's) inc fixing screws

Front and Rear panels

PCB

Programmed ATmega328

LED2 3mm Red LED

LED3 3mm Orange LED

LED1 3mm Dual Colour (Red/Green) LED

33v Zener Diode* Now not needed or supplied in latest kits

1 x RFC 220uH Choke Inductor

PCB Push button

2 position DIP switch

10K Bias Trim Pot

3V PCB Battery Holder

3V Battery CR1220 (**Keep away from young children**)

Q1 1 x BS170 FET

BNC 50 ohm panel socket

4 x Stick On Feet

Band Pack of choice (see below) **

Part	Low Band 60/40m	Mid Band 30/20m	High Band 15, 12, 10m
C21	470pf	220pf	22pf * See Note
C20	1000pf	470pf	220pf
C19	470pf	470pf	220pf
C9	56pf	Not used for High Band	Not used for High Band
C17	120pf (Red Tip)**	Not used for High Band	Not used for High Band
C6	Not Used for Low Band	Not used for High Band	Not used for High Band
C28	100pf	220pf	120pf (Red Tip)**
L2	1uH	0.68uH	0.33uH
L3	1uH	0.68uH	0.33uH
L4	2.2uH	0.68uH	0.33uH

*C21 on HIGHBAND kit now changed to 22pf, You may have an extra 120pf in your kit
If so consider it a 'spare' and don't use it. If you have a kit supplied before May 2026
you can fit 120pf ** Later band packs have the 120pf cap marked by a Red Tip



Reading Capacitor values

Take care reading the values printed on capacitor, some people do not understand the way to read the markings, let look at two values 22pf and 220pf.

The capacitor is marked with a 3 digit number, the first 2 digits give us the first two numbers of the value, so a 22 pf AND a 220pf will both be '22', the third digit tells us how many zeros to add to that number, so the 22pf capacitor will be marked 220, that decodes to 22 + no extra zeros, hence the value of 22pf. A 220pf capacitor will be marked 221, that's 22 + 1 extra zero = 220pf. Be carefull not to use the wrong value

You can use a magnifying glass or zoom in using your mobile phones camera to see marking better.

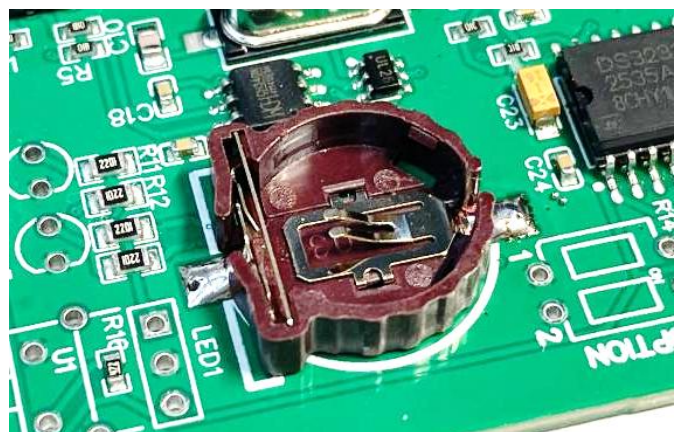
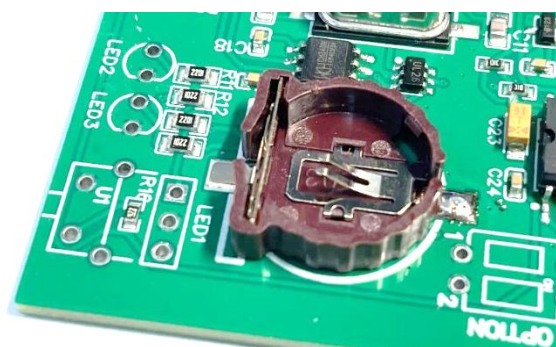
Stage One : The backup Battery Holder

Our Whisper mite has a very accurate real time clock built in, this even has an internal TXCO. Normally time keeping is maintained by the 5V source powering the whisper mite but we want the time keeping for the transmission slots to be maintain even with the power off. We are using a small CR1220 cell for this. We have now to install the holder for this cell, it's a SMD part, but a very large SMD part!

Put a nice blob of solder onto one of the exposed holder tag points. Place the holder on the board positioned so it's sitting as shown.

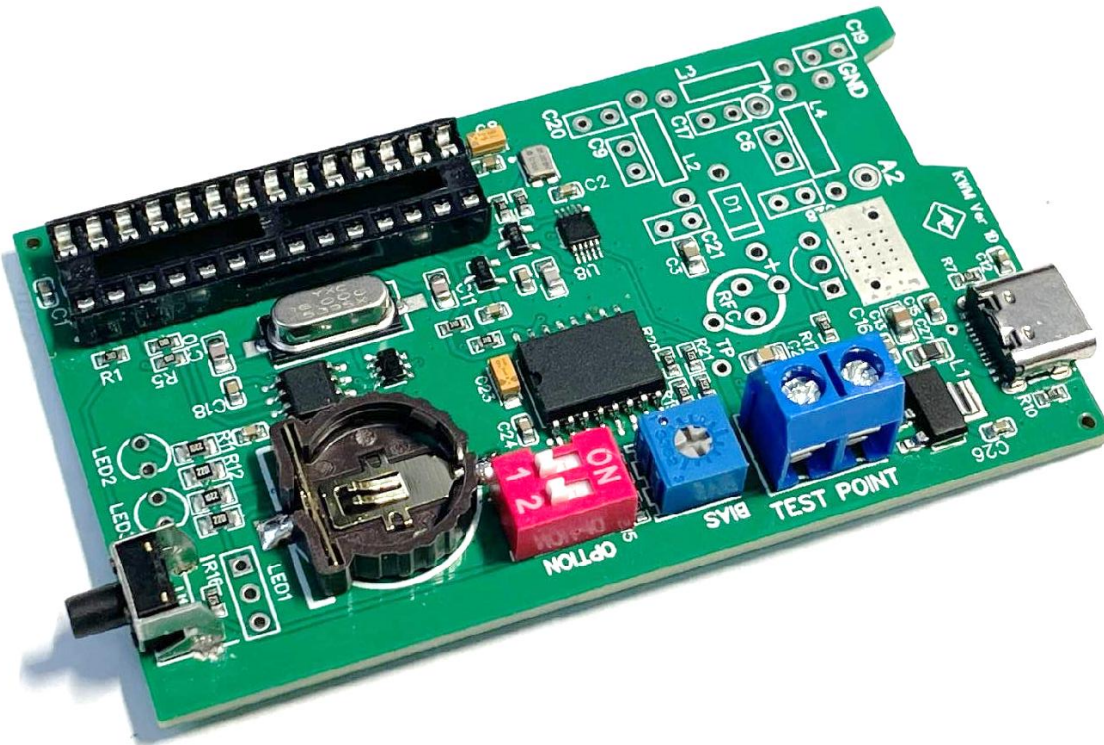
Carefully remelt the solder blob while keeping the holder in place. Make sure the holder is positioned square and the unsoldered tag is sat on the other mounting pad. If not resolder the tag and reposition. When happy solder the second tag while keeping the holder in place.

We will fit the battery when we have finished all the build.





Stage 2: On Board Controls



We now will fit the few on board controls,

Find the 10K blue trimmer, this controls the bias current to the PA transistor (detail on adjusting this later) but for now **set this Fully Anticlockwise**

Follow this with the two way block, this is to allow us to measure the current with a test meter, in normal operation you will need to put a link wire between the two blocks (an off cut from one of the inductors /diode is a good choice so when we fit these later save the off cuts).

The open terminals of the block should be towards the edge of the board.

Next, we have the 2 position switch block, this is fitted just below the trimmer. Note the printing on the switch, the 'ON' marking should be nearest to the blue trimmer.

Final part for this section is the Sync button, this mounts on the front edge of the board make sure it's is sat right down and square when soldered.

There are there versions of the next stage, it depends on if you're building the Low Band , Mid band, or High Band version. Follow the section for your build!



Stage 3 LOW BAND Version ONLY

The Low Pass filter

Step 1 : Inductors



We are building the KWM for two bands but have only one LPF, for 60m and 40m.

The PCB is designed for a number of different LPF designs so follow the instructions for this version.

We have 4 inductors to fit, the first is very easy. On the board you will see a circle with RFC inside of it, just by the Blue terminal

block we have already fitted.

We have a large cylinder shape inductor, this is the RF Choke (220uH). Fit this in the position marked RFC the board as mounting holes the correct pitch for this so it's an easy part to fit, just fit it vertical and straight down on the board.

The next part to fit are the two 1uH inductors, we have used moulded inductor for the PA for simplicity. The ones we have selected are TDK high Q inductors and offer much better performance and less loss than those more common green body miniature versions.

The 1uH ones have bands of Brown, Black, Gold, Silver

You will need to carefully fold the legs of these two inductors

right at the body. The area tight fit to the position on the PCB so the leads really need to be folded right where they come out of the body.



Do this with care.

Solder these in place for L2 and L3, make sure these are right down on the board. **Important keep the off cuts from these parts!**

Now fit L4 which is a 2.2uH inductor. This inductor has bands Red, Red, Gold, Silver. Fit it the same as L2 & L3. Keep the off cuts.

You may have a position on the board marked D1, this was a 33v PA protection diode. This diode is not required and will be removed from future PCB's. The PA voltage is below 6v and

will never get anywhere near 33v. The diode only adds a point of failure to the kit so is no longer provided.

Step 2 Capacitors



We have the following capacitors to fit

C21	470pf (marked 471)
C20	1000pf (marked 102)
C19	470pf (marked 471)
C9	56pf (marked 560)
C17	120pf (may be red tipped)
C6	Not Used for Low Band
C28	100pf (marked 101)

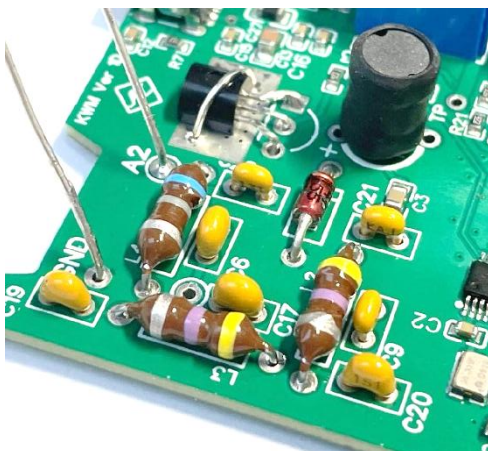
All these capacitors look the same so be careful not to mix them up, Use a magnifying glass or zoom in with your phones camera to read the markings on these capacitors as the print is always VERY small. fit them right down on the board and trim their leads after soldering in place. You don't need to keep the offcuts from these. Note C28 position just to the left of the silver square for the PA transistor, its silk screen printing is not too easy to read.

The low band version will produce more power than the other two versions do not be tempted to run more than stated 200mW on 40m. on 60m you will find you will be running approx. 250mW if 40m is set for 200mW.

Stage 3 For MID BAND Version only

The Low Pass Filter

Step 1 : Inductors



We are building the KWM for two bands but have only one LPF for 30m and 20m.

The PCB is designed for a number of different LPF designs so follow the instructions for this version.

We have 4 inductors to fit, the first is very easy. On the board you will see a circle with RFC inside of it, just by the Blue terminal block we have already fitted.

We have a large cylinder shape inductor, this is the RF Choke (220uH). Fit this in the position marked RFC the board as mounting holes the

correct pitch for this so it's an easy part to fit, just fit it vertical and straight down on the board.

The next parts to fit are three 0.68uH inductors, we have used moulded inductors for the PA for simplicity. The ones we have selected are TDK high Q inductors and offer much better performance and less loss than those more common green body miniature versions.

The 0.68uH ones have bands of **Blue, Gray, Silver**

You will need to carefully fold the legs of these three inductors right at the body. They are a tight fit to the position on the PCB so the leads really need to be folded right where they come out of the body.



Do this with care.

Solder these in place for L2 L3, & L4 make sure these are right down on the board. **Important keep the off cuts from these parts!**

You may have a position on the board marked D1, this was a 33v PA protection diode. This diode is not required and will be removed from future PCB's. The PA voltage is below 6v and will never get anywhere near 33v. The diode only adds a point of failure to the kit so is no longer provided.

Step 2 Capacitors



We have the following capacitors to fit:

220pf (marked 221)	C21
470pf (marked 471)	C20
470pf (marked 471)	C19
Not used for Mid Band	C9
Not used for Mid Band	C17
Not used for Mid Band	C6
220pf (marked 221)	C28

All these capacitors look the same so be careful not to mix them up, Use a magnifying glass or zoom in with your phone's camera to read the markings on these capacitors as the print is always VERY small. Fit them right down on the board and trim their leads after soldering in place. You don't need to keep the offcuts from these. Note C28 position just to the left of the silver square for the PA transistor, its silk screen printing is not too easy to read.

The Midband version should be set to produce approx. 200mW on both bands but with the higher frequency efficiency starts to drop, it may be that on 20m you find you struggle to get the full 200mW, do not run at max power, always make sure you are below the peak power



level to protect the PA. Running the PA at max power just puts the PA transistor under a lot of strain as the current can be high if the power is set to max, just dropping a few 10's of mW makes a lot of difference to the PA current but no noticeable difference to reports. Set the power on 20m, 30m will be slightly more power than 20m which is fine.

Stage 3 For HIGH BAND Version only

The Low Pass Filter

Step 1 : Inductors



We are building the KWM for two bands but have only one LPF, this covers 15,12, and 10m

The PCB is designed for a number of different LPF designs so follow the instructions for this version.

We have 4 inductors to fit, the first is very easy. On the board you will see a circle with RFC inside of it, just by the Blue terminal block we have already fitted.

We have a large cylinder shape inductor, this is the RF Choke (220uH). Fit this in the position marked RFC the board as mounting holes the correct pitch for this so it's an easy part to fit, just fit it vertical and straight down on the board.

The next parts to fit are three 0.33uH inductors, we have used moulded inductors for the PA for simplicity. The ones we have selected are TDK high Q inductors and offer much better performance and less loss than those more common green body miniature versions.

The 0.33uH ones have bands of **Orange, Orange, Silver**

You will need to carefully fold the legs of these two inductors right at the body. The area tight fit to the position on the PCB so the leads really need to be folded right where they come out of the body.

Do this with care.

Solder these in place for L2, L3, & L4 make sure these are right down on the board.

Important keep the off cuts from these parts!



You may have a position on the board marked D1, this was a 33v PA protection diode. This diode is not required and will be removed from future PCB's. The PA voltage is below 6v and will never get anywhere near 33v. The diode only adds a point of failure to the kit so is no longer provided.

Step 2 Capacitors



We have the following capacitors to fit:

22pf	C21
220pf (marked 221)	C20
220pf (marked 221)	C19
Not used for High Band	C9
Not used for High Band	C17
Not used for High Band	C6
120pf (marked 121, red tip)	C28

All these capacitors look the same so be careful not to mix them up, Use a magnifying glass or zoom in with your phones camera to read the markings on these capacitors as the print is always VERY small. Fit them right down on the board and trim their leads after soldering in place. You don't need to keep the offcuts from these. Note C28 position just to the left of the silver square for the PA transistor, its silk screen printing is not too easy to read.

This high band version will run slightly lower power levels than the other version. As frequency increase the efficiency drops.

You will set two bands when you configure the Whisper Mite. Set the output power for the highest frequency band you will be using, you will be able to generate approx. 200mW on 10m and more on lower bands. DO NOT drive the PA at max power, always drop back from the peak level, you may notice the power level start to drop if you try and get more power than the peak, always leave a little head room with power or damage could occur to the PA transistor. lower bands will produce more power.

Stage 4 PA Transistor

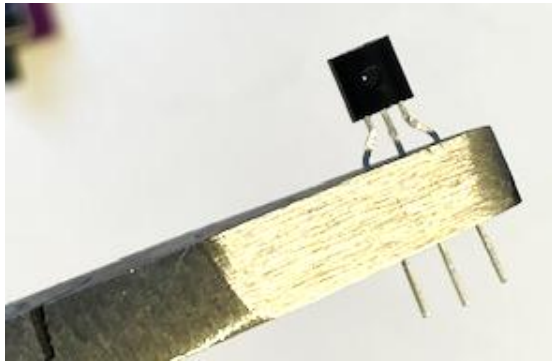
We are using a single FET transistor for the PA. We have used a very common FET for this application the BS170. There are other transistors that could be used but the BS170 is a well know and commonly used in this type of application, running at the power levels we are using it is also very robust.



We are running this well below its specification limits.

Despite running it very lightly we have used the copper ground on the PCB as a heatsink, maybe unnecessarily but it certainly will do no harm. I doubt even with extended use that you will be able to feel any temperature increase on its body.

The first job is to carefully fold the legs at 90 degrees to the body, look at the photo here for



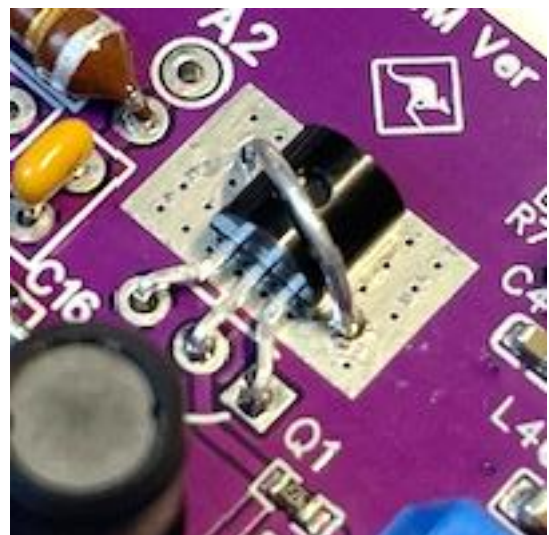
details on where to make this bend, I use a pair of pliers to do this. The fold is just about at the shoulders

of the three leads as can be seen here. Note which way the fold is made, the flat face of the transistor will need to be pointing downwards when done.

Now fit the FET in place on the board. The flat side of the FET should be resting on the exposed silver area. If you wish and you have some, you can put a TOUCH of heat transfer paste on the face of the transistor but I don't feel it's needed, in normal use the FET doesn't even get warm! Just solder the middle leg for now, check that the body is right down on the silver pad and square. You can now solder the other two pins and trim the leads.



Now you were asked to keep the offcuts from the inductors and the diode. We need to use one of the offcuts now. The off cuts should be about an inch (25mm) or more. Now push this off cut through one of the two small holes in the silver pad from the underside of the board. **This is going to get hot so take care**, solder this wire such that a few millimetres of the wire remain under the board and most of the length is sticking up on the top of the board, thread this free end across the body of the FET and through the other hole in the silver pad to hold down the transistor tight to the main board,





I use a pair of long nose pliers to do this and then pull the wire tight under the board before soldering and trimming this wire in the second hole. This should hold the transistor against the silver pad that acts like a heatsink.

Stage 5 LED's

Now we have the three LED's to fit, this may be the hardest part of the build so take your time.

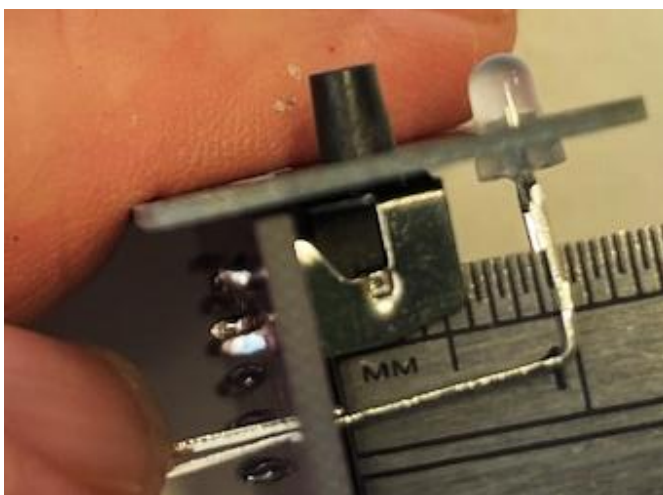
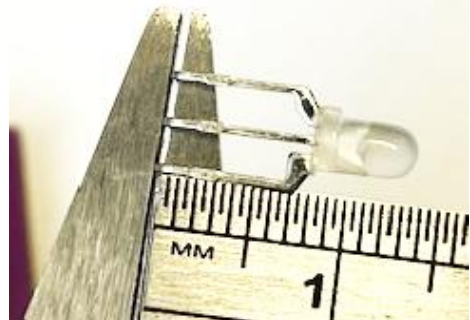
LED 1 is dual colour Red /Green (Red=TX, Green Standby)

This LED has 3 legs the outer legs are different lengths.

The short lead has to go into the hole nearest to the edge of the board

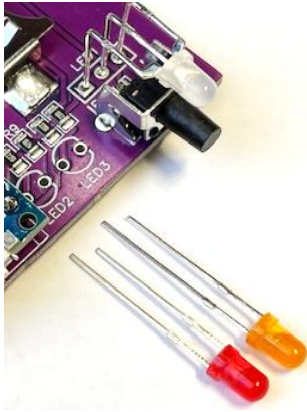
We need to bend these legs 90 degrees to fit correctly (see photos below)

Once bent the LED should be mounted so the bend sits about 10mm from the top of the board.



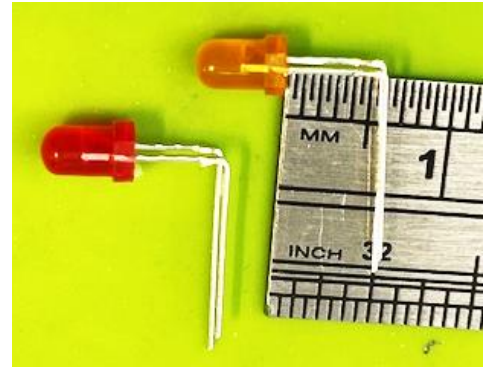
I pop the front plate loosely in place to check the LED is about the correct height, you can see its about 10mm from the top of the PCB.

Now you have two other LED's to fit a red one and an Orange one.



These LED's show a representation of which one of the 4 tones is being transmitted. Which colour goes where doesn't really matter, so you can swap these around if you want to other wise take the red LED, we will fit this in position marked LED2, you can see the legs are different lengths, **the short leg should go into the hole to the right of the LED symbol** (front of the board facing you) bend the LED legs 90 degrees approx 6mm from the back of the LEDs body, when fitting the LED it should also be

approx 6mm above the board (see photos). Be careful as there isn't a lot of space between pins for these two LED's. Do the same with the orange LED too. You can check again with the front plate if you have these at the correct height .



Stage 6 : BNC antenna socket



Put the main board down safe for now. We need to fit the RF connector to the rear panel.

The rear panel has a shaped cutout for the BNC, this stops it rotating when fitting a plug.

Take the nut, ring, and washer off the back of the BNC. Pass the BNC though the rear panel and then fit the ring washer with the solder tag (I bend the tag forward at 90 degrees first to make it easier to get to later) then the crinkle washer

and finally the nut. Now tighten the nut to secure it all to the panel.

Solder a small blob onto the tag and also the centre pin of the BNC, this will make it easy to solder the wires to later. If not already bend the tag of the ring washer so it's 90 degrees to the rear panel.

Screw this panel to one half of the case, this half will be the bottom of the KWM.



I said before that the board allows different LPF designs, for the Low Band Version (40/60m) we need to put two wires from the board to the BNC, one is the ground wire that will go to the ring washer and the other will connect to the centre pin.

Low Band Version 60/40m

For this version look at the board in the LPF section, you will see one hole by C19 marked GND and one hole next to C17/C6 marked A, these are the connection points we need to use for this version. **DO NOT** Use the pad marked A2! Remember those off cuts ? we will use two more now. Push these offcuts from the underside of the board so you have about an inch sticking up out of the board on the top, solder the wire on the underside of the board and trim the wire on the bottom only. Again, these wires will get HOT so do this with care.

Mid and High Band Versions 30/20m or 15/12/10m

For this version look at the board in the LPF section, you will see one hole by C19 marked GND and one hole by the edge of the sliver square used for the heatsink for the PA transistor marked A2, for this version **DO NOT** use A, these are the connection points we need to use for this version. Remember those off cuts? we will use two more now. Push these offcuts from the underside of the board so you have about an inch (25mm) sticking up out of the



board on the top, solder the wire on the underside of the board and trim the wire on the bottom only. Again, these wires will get HOT so do this with care.

Now inspect the board for any missed solder joints or short-circuiting blobs between pins, trim the leads nice and short so they don't catch the bottom of the case.

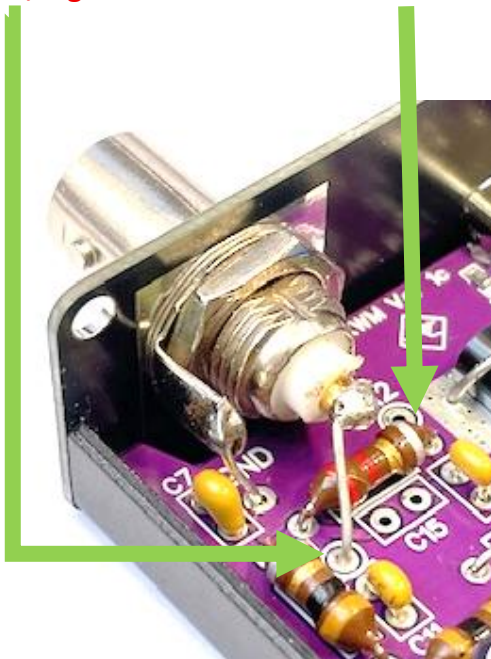
Slide the main board into this bottom section of the case, make sure its sliding into the two grooves in the case.

The board should slide right up to the back panel. Position the two antenna connection wires so they are in place on the BNC socket.

Solder the GND wire to the tag and the other (A or A2 depending on band) to the centre pin, trim any excess wire.



The photo here shows the Low Band version with A , higher band versions uses A2 Pad.



Stage 7 Testing Time

Now fit the front panel, the LED's should pass though the corresponding holes in this panel.

Check the fit.

Now Plug in the control chip, there is a little dot on the chip which is near pin 1. **This pin must be nearest to the front edge of the board**

Now another important check for you, the blue trimmer **MUST be turned fully anticlockwise**. This control sets the bias current to the FET, incorrect setting of this can destroy the FET.

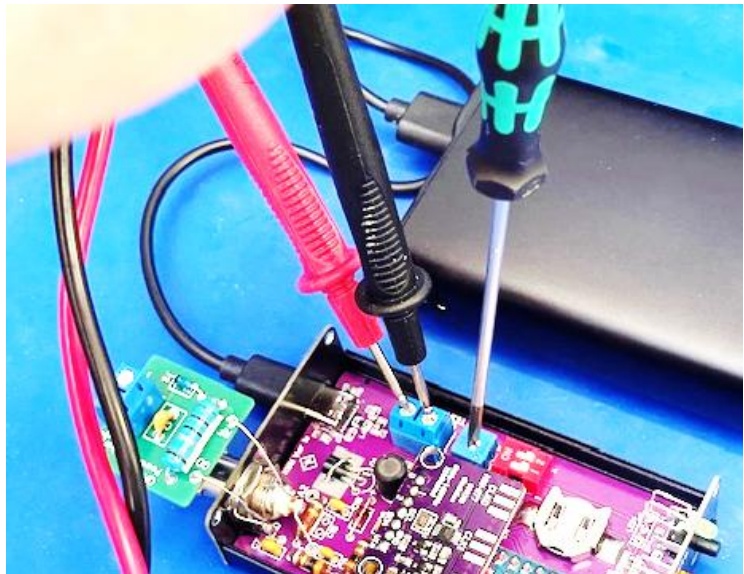
If you have a suitable QRP power meter you can connect that, if not then look at the end of these instruction, this is for the FREE Bonus QRPp (less than 1 Watt) power checker kit you



have received in a separate bag with the whisper mite. Build that following the instructions and connect that as shown.

You now need your 5v supply, either a good quality phone charger or one of those phone battery packs that can be used to power other 5V devices, you also need a DC multimeter or a least a way to measure current 0-200mA range. The connector on the KWM is a USB 'C' type. Now plug the power supply into the KWM. Put you test meter on the mA range and place the two leads from the meter across the two screw terminals of the blue block.

You should see current flow now of around 20-30mA. The LED on the front of the Whisper Mite will light Green, SLOWLY adjust the blue trimmer clockwise, at first nothing will happen but around half way the current will start to go up. This happens fast, so turn the control slowly. Allow a little current increase of around 5-10mA, this will be a good starting place. We will adjust this control again later



Now take the leads off the terminal block and remove the power.

Slide the board out of the case by removing the two back panel screws, you MAY be able to do the next stage with removing the board but taking it out is easier for many people, it's up to you.

One of those offcuts again, I use the ones from the diode as they are nice and thick. Make a 'U' shape from the off cut and slide it into the opening on the terminal block to form a connection between the two terminals.



Check its nice and tight. The last thing we need to fit on the board is the 3V backup battery for the time keeping. This battery just pops into the holder with the positive side upwards. (the battery will have a '+' mark on one side (normally the side with other engraved markings) don't forget this side facing upwards.

WARNING

This is a small lithium backup battery, DO NOT let Children play with this or short circuit the battery as they are dangerous.



Replace the board if you removed it and fit the front and rear panels to the bottom section, do not over tighten the screws just yet or you will not get the top half of the case on.

TIP, if the screws feel tight as you put them in it's a sign you have them cross threaded, they should go in nice and easy, if they don't, take it out and 'wiggle' the screw as you start it off again.

You will need to configure the whisper mite now for the bands that you have built it for before you can do the power check. Look at the User Guide document for how to do this.

Now follow the instructions for checking your output power using the power checker board you still have attached, be sure to set your meter to volts not current now! If you have a 0-10v range on your meter use that. Once happy remove the power checker board.

If you are using an external power meter it needs to be able to read power levels of less than a watt. With the power checker kit board removed from the whisper mite and the RF meter connected power up the whisper mite. Now leave the whisper Mite powered up You should have already configured the band and frequency at this stage be warned most power meters will not be very accurate at such low power levels. Some will read high, some low. Our little power checker is going to be more accurate than most commercial meters.

If you have configured your mite we can use the calibration feature to check and set the output power. There is a block with two switches, position 1 and 2, slide position 1 down and position 2 up. Now plug in the Mite, it will start flashing the red LED above the sync button. It is now in calibrate mode and for now you can use this to set the output power, its now creating a steady carrier on the frequency you set in F1 on the configuration page. Adjust the blue trimmer again now to get the desired output power, never leave the output set at max, always back it off a little, you should be able to get approx. 200mW. Reset both switches to down after this and restart the mite .

if you still have our power checker in place now is the time to remove it.

Now you can put the top half of the case on and fix that with the remaining screws. The top half will only fit correctly one way, if you look at the edges of the case you will see one side has a groove and the other a ridge, make sure the ridge on the top section goes into the groove side of the bottom half. Now tighten all the screws.

The KWM is built.

You may want to revisit the user guide again now so you can consider If you need to change any settings

Appendix A

Antennas

Now the most important part of any transmission system is the antenna.

A good antenna and you will see your reports come flying in from 1000's of miles away.

Of course this will also depend on propagation, time of day/night, sunspot activity and other factors, this is one of the interesting and informative factors that people use WSPR to learn about.

Now because we have used low power I find that I don't worry too much about SWR, yes you should really, and a good matched antenna will give you the best result without a doubt. Often though we don't really have that perfect antenna. I have tried and been surprised by the results from using 'opportunistic' antennas, such as step ladders, wire coated washing lines full of clothes and even just a random wire around the upstairs bedroom.

The only thing I would say is don't put a short circuit on the output, I have run mine here for a couple of days without problem with no antenna connected (by mistake but a good test) but a short circuit should really be avoided.

The PA transistor is a low cost device but If you ever need to replace it don't use the ones from places such as eBay, Aliexpress etc, they are often fake and do not perform anywhere as well, often drawing more current, excessive heat build-up and giving less output power, I can provide spares at a low price if you need them or use RS/Farnell etc , that's what I use.

Appendix B

Problems?

A few common problems that may catch you out if your new to WSPR

The first is to be sure you have correctly entered your callsign, locator and power level.

If you enter a none valid callsign for example most decoding software packages will reject it and not show a decode for you, they consider it a corrupted reception. Re-enter this information with the 'Q' command again if we are transmitting but no decodes eg 'Q MOBMN IO82 23'

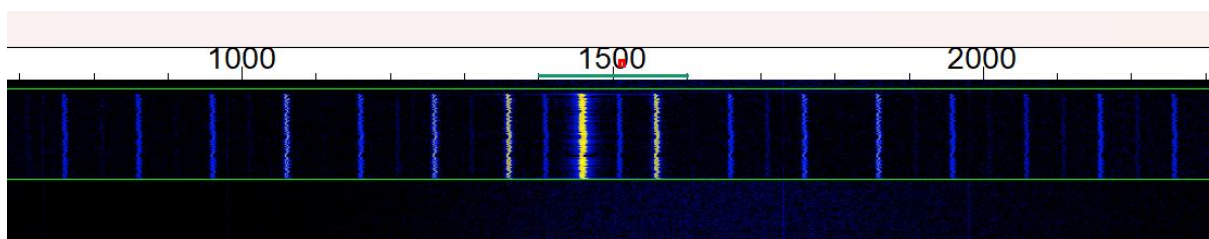
Time not synced, this is also a common problem, maybe the most common, make sure you **accurately** set the sync time. The system will allow a few seconds error but more than that and you will get no decodes, remember its not just the start of a new minute you are syncing too but the start of a new **EVEN** minute, this catches out many people to start with.

We are using an accurate Real Time Clock module, but you may need to re-sync the time occasionally, typically ever few weeks to a month.

Another common problem is setting the transmission frequency wrong, be sure you are within the +/- 100Hz of the band centre frequency. Start with the default frequencies.

Buzzing sound on transmit?

If you're monitoring your own transmission with a local receiver don't be alarmed if you feel there is a slight buzzing sound on your transmission or if you look at the waterfall while receiving your own transmission you see something like the screenshot below.



You can see what looks like sidebands extending a number of KHz from your main frequency. If you look carefully you will notice they are at either 50 or 100Hz apart (in the UK) which is the UK mains frequency, if your country uses 60Hz then expect them to be 60 or 120Hz apart. This is just the result of RF getting into your local wiring and not something that is being transmitted from your transmitter. You don't need to worry about it. Remote station will not get this problem.

**WSPR drift notes**

When you view reports on sites such as <https://www.wsprnet.org/> you'll see a "Drift" value for each reception. Most reports show '0' while some receivers report 1 Hz or occasionally 2Hz. Higher drift values do not necessarily mean your transmitter is the cause.

Small measured drifts can come from the receiver rather than the transmitter. We're talking about 1–2 Hz change over a two-minute transmission, which is easily produced by a receiver's oscillator. Propagation is another common cause: reflections, multiple hops, and Doppler effects from moving ionospheric irregularities can change the signal's phase or arrival time and produce an apparent frequency shift at the receiver. These Doppler effects are due to changes in the propagation path (traveling ionospheric disturbances, moving reflection points, or a time-varying refractive index) and are independent of transmit power.

Such propagation effects often appear at only a subset of receiving stations. If your transmitter truly has a frequency-stability problem, nearly every station that hears you will show a similar offset. Isolated high-drift reports from a few receivers usually point to receiver instability or local propagation (Doppler/multipath) rather than a transmitter fault.

Free Bonus Kit RF Power Checker

Many of us have power meters but few have a meter that can be used to check power levels down to 1W or less. The Whisper Mite runs at around 200mW and most power meters are useless at the power level.

This kit gives us a way to measure power levels down to the mW range and It's a great way to check the power output from transmitters such as the Whisper Mite.

Lets get it built, only a few parts.

Parts List

PCB

51 Ohm 2 watt Resistor

0.1uf Ceramic Capacitor (Marked 104)

BAT46 Diode

2 way Terminal Block

This is a simple build just take care to fit the diode the right way round, the band on the diode should match the printed band on the symbol on the board.

Also be sure to fit the terminal block so the open terminals are next to the edge of the board.

Keep the off cuts from the resistor for now!

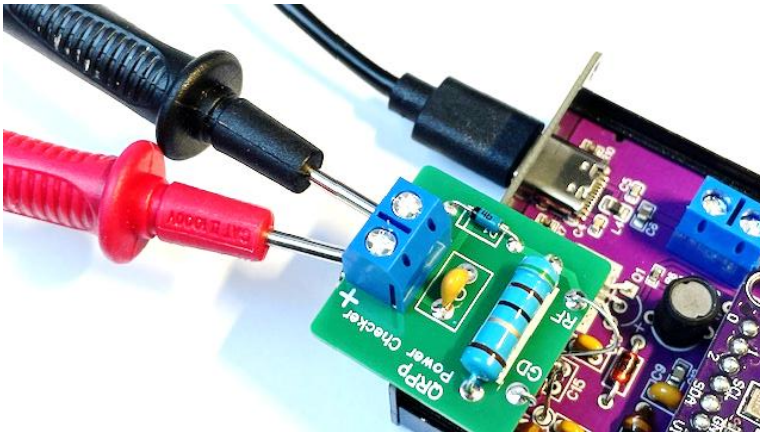
How to use the Power checker

Use the offcuts from the resistor and solder them as shown in the picture here. These will allow us to tack solder the checker to the back of the BNC socket on the whisper Mite.

Heres how to attach it to the Whisper Mite.



Now your connected we need to connect our DC volt meter (a standard pocket meter will do set to 10v DC range)



Now leave the whisper Mite powered up, remember what frequency you set in F1 when you configured the Mite. You can set a radio to receive that frequency.

There is a block with two switches, position 1 and 2, slide position 1 down and position 2 Up. Restart the Mite. This will make the mite transmit a steady

carrier on the F1 frequency. The Sync LED will flash rapidly red.

When the transmission starts the meter should display a voltage, look at the chart below to convert the voltage to a RF Power level . We are trying to set this up for 200mW. That is aprox 4.3V DC from our board. To adjust the power level slowly adjust the blue trimmer to get this voltage, do not try and get as much power as you can. That will likely damage the PA transistor. In this kit 200mW is plenty of power for whisper mode. If coming from SSB (or even CW) modes this will seem a low amount of power I am sure but trust me, this will cover 1000s of Kilometre's. More power will only produce heat and that in turn will increase drift factors which will reduce the number of 'spots' that get reported for your callsign.

Once set you can remove the module from the BNC and you're done. Keep the module for any future projects.

Use the Estimated Voltage column for your measurements, that allows for the forward volt drop across the diode in the kit.

Power (mW)	Power (dBm)	Node V_{rms} (V)	Node V_{pk} (V)	Estimated V_{DC} (V)
50	17.0 dBm	1.597	2.258	2.008
100	20.0 dBm	2.259	3.195	2.945
150	21.8 dBm	2.765	3.912	3.662
200	23.0 dBm	3.196	4.519	4.269
250	24.0 dBm	3.572	5.052	4.802
300	24.8 dBm	3.911	5.533	5.283
350	25.4 dBm	4.225	5.976	5.726
400	26.0 dBm	4.519	6.392	6.142
450	26.5 dBm	4.795	6.781	6.531
500	27.0 dBm	5.051	7.142	6.892

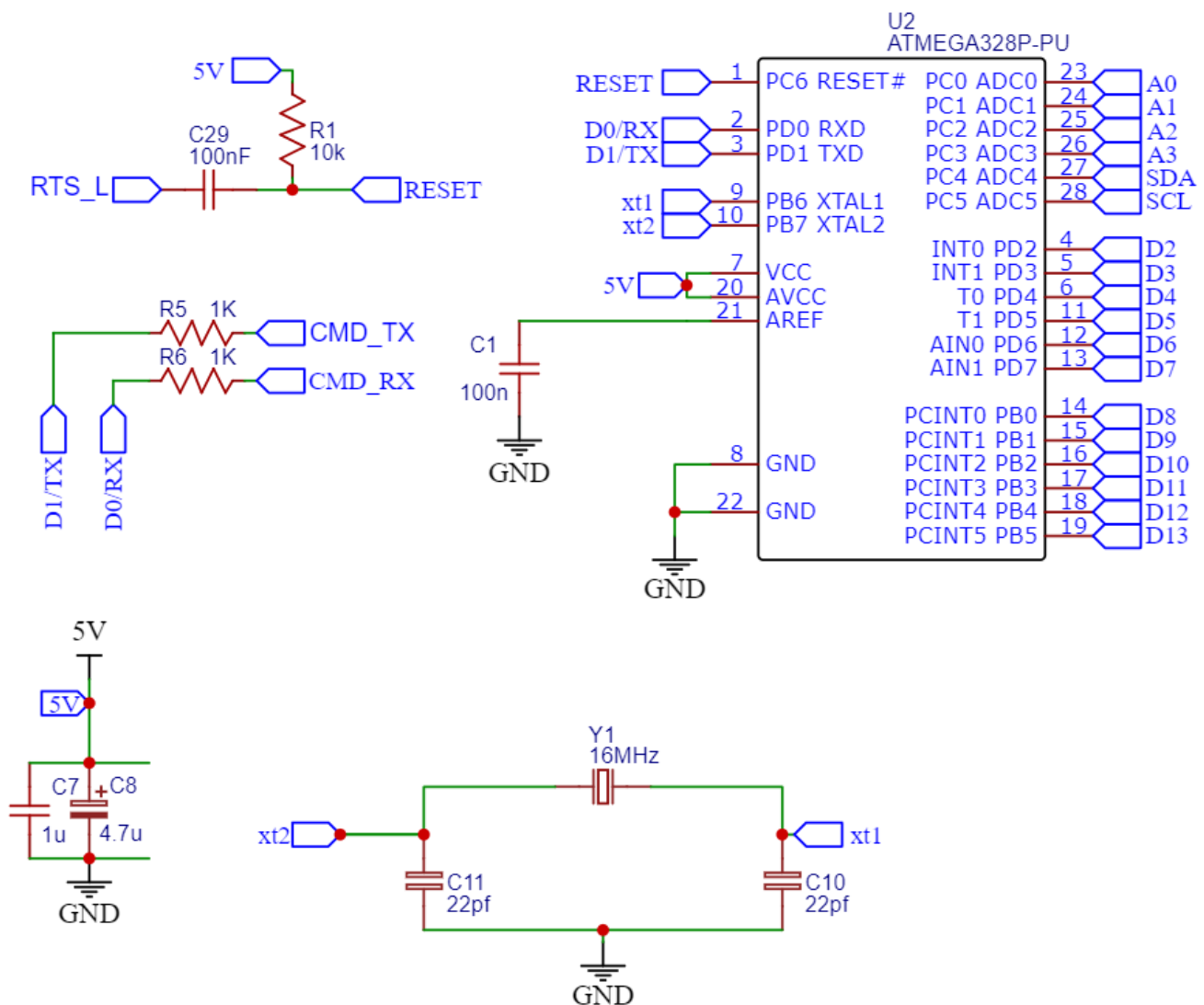


From time to time the WhisperMite will have firmware updates, I will be happy to provide these updates FOC via email in a HEX file format if you can program the ATMEGA328 yourself, otherwise I can send a replacement chip ready to fit, there will be a small cost to cover the chip and postage if you take this option. The Chip and code are hardware locked and will only work with the Whispermite PCB.

Circuit Information

The circuit for the Whisper mite is broken down into different sections

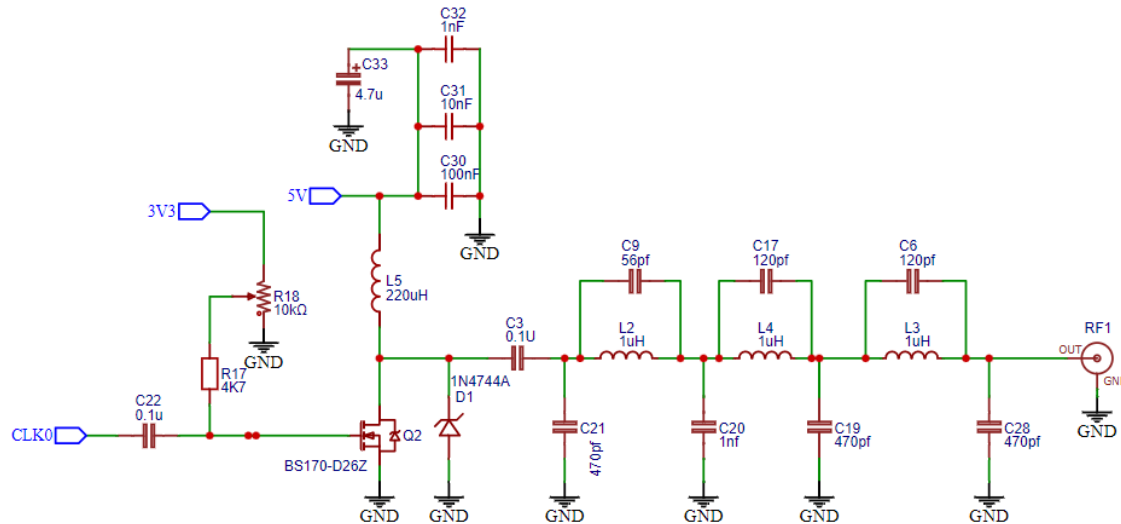
The Whisper Mite CPU





Whisper Mite PA and LPF

Values of LPF (depend on Band See band Pack)



Whisper Mite MS5351 Clock Circuit with TXCO

