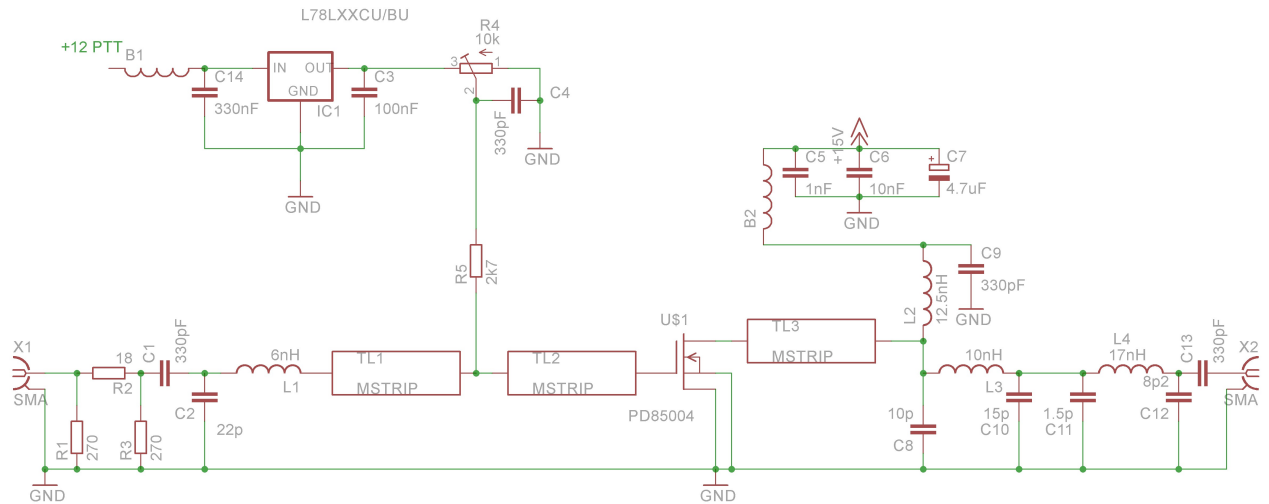


## 70cmcm LDMOS Driver board

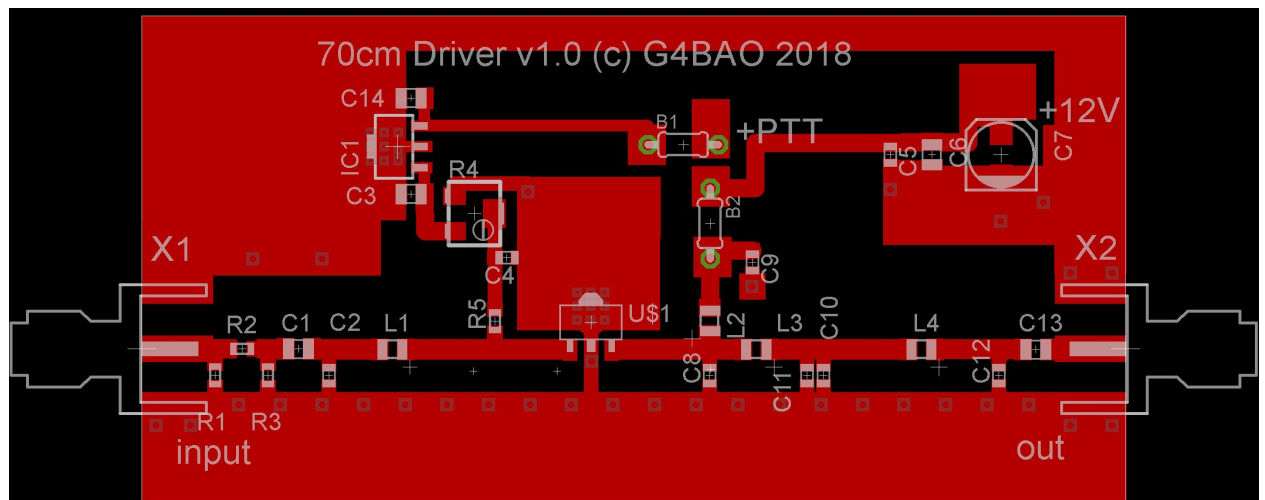
### Assembly notes

This kit contains the components required to build a G4BAO 70cms driver amplifier

This document is correct for the issue 1.0 PCB.



**Figure 1 Circuit diagram**



**Figure 2 PCB layout**

### **Antistatic precautions**

Note that the LDMOS power FET device is susceptible to static damage until the board has been assembled. Do not remove from the packaging without wearing an antistatic wrist strap or at minimum before having first touched something grounded.

## Component list

| Component       | Value             | Type                           | Colour code                  |
|-----------------|-------------------|--------------------------------|------------------------------|
| R1,R3           | 270R              | SMD 0603                       | Green/Black card (R bag)     |
| R2              | 18R               | SMD 0603                       | Pink/Yellow card             |
| R4              | 10k               | SMD preset                     | Trimmer in clear plastic     |
| R5              | 2k7               | SMD 0603                       | Yellow/Green card            |
| C1, C13, C4, C9 | 330pF             | ceramic 0603                   | Yellow card (C bag)          |
| C2              | 22pF              | ceramic 00603                  | Pink card                    |
| C3              | 100nF             | ceramic 0805                   | Black/yellow card            |
| C5              | 1nF               | ceramic 0603                   | Orange card                  |
| C6              | 10nF              | ceramic 0805                   | Black plastic                |
| C7              | 4.7 uF 35V        | SMD electrolytic               | Round metal can              |
| C8              | 10pF              | ceramic 0603                   | Black/Green card             |
| C10             | 15pF              | ceramic 0603                   | Green card                   |
| C11             | 1p5               | ceramic 0603                   | Purple card                  |
| C12             | 8p2               | ceramic 0603                   | Green/purple card            |
| C14             | 330nF             | ceramic 0805                   | Clear plastic                |
| L1              | 6nH               | Coilcraft air core 0806SQ-6N0G | Black plastic (L/IC bag)     |
| L2              | 12nH              | Coilcraft 0805HQ-12NX E        | No colour plastic            |
| L3              | 10nH              | Coilcraft air core 0807SQ-10NG | Purple plastic               |
| L4              | 17nH              | Coilcraft air core 0807SQ-17NG | Green plastic                |
| B1, B2          | Dual ferrite bead | Panasonic EXCELDRC35 or 25     | Obvious!                     |
| IC1             | 5V regulator      | L7805CU/BU SOT-89 package      | Black plastic Marked “8J HK” |
| U\$1            | LDMOS FET         | PD85004 SOT-89 package         | Black Plastic Marked “8504”  |

Check that all the components and the PCB are present in the kit, and email [john@g4bao.com](mailto:john@g4bao.com) immediately if there is anything missing.

## Tools

Use a small (1mm bit or smaller) temperature controlled, earthed soldering iron, and thin (28swg) solder.

A pair of small sharp side cutters

Small SMD tweezers

## Assembly

This kit contains very small 0603 components that all look the same or similar. The packaging is colour coded as above. BE VERY CAREFUL not to "ping" them across your bench when removing them from the packaging, as I will not support the kits if replacement components are fitted that are not supplied by me. Never remove a component from the packaging until you are about to fit it so as not to mix them up. Take great care when selecting the semiconductor device as the voltage regulator and the LDMOS FET are in the same package with different markings. Refer to the component list above to get the right part.

To fit the board in a recommended standard Schubert box (not supplied) small notches need to be taken out of two corners with a small file to allow the overlap of the tinplate. Do this before assembly.

1. Fit the three resistors R1-3. **Do not fit R5 yet**

2. Fit the ten 0603 ceramic capacitors C1,C2,C4,C5, C8-13
3. Fit the three 0805 ceramic capacitors C3,C6,C14
4. Fit C7. Observe polarity. The black end is ground This fits OVER the pads provided so solder it in with care.
5. Fit the inductors L1 -L4.
6. Fit the Preset R2
7. Fit the voltage regulator IC1
8. Fit the ferrite beads B1 and B2 soldered under the board. Take care as the gap from the pad to the ground plane is VERY small

## **DO NOT FIT THE LDMOS DEVICE U\$1 YET**

### **Initial check**

RE-CHECK THAT YOU HAVE NOT FITTED THE DEVICE or R5 YET.

If you have, remove R5 and place it to one side until after the initial voltage checks, when you can replace it!

Make sure that the cut leads of the beads do not short to ground.

Check for shorts to ground on the +13.6V rail

Rotate R4 fully ANTICLOCKWISE and using a thin wire, apply a regulated +13.6 volts to the +PTT connection, and ground to the ground plane.

Measure the voltage at the junction of R4 and C3. It should be 5 volts +/- 0.2

Measure the voltage at the junction of R5 (not fitted yet) and C4. It should be 0V

Rotate R4 fully clockwise. The voltage should rise to 5.0V +/- 0.2. Rotate R4 fully anticlockwise and the voltage should return to 0V.

Leave the preset at this setting and remove the 13.6-volt supply.

### **Fitting the LDMOS device U\$1**

Note carefully the position of the device in Fig 2 and place it carefully and solder the centre pin.

Check again that the device is square on the board and the Tab covers all the small plated through holes.

Solder the other two leads.

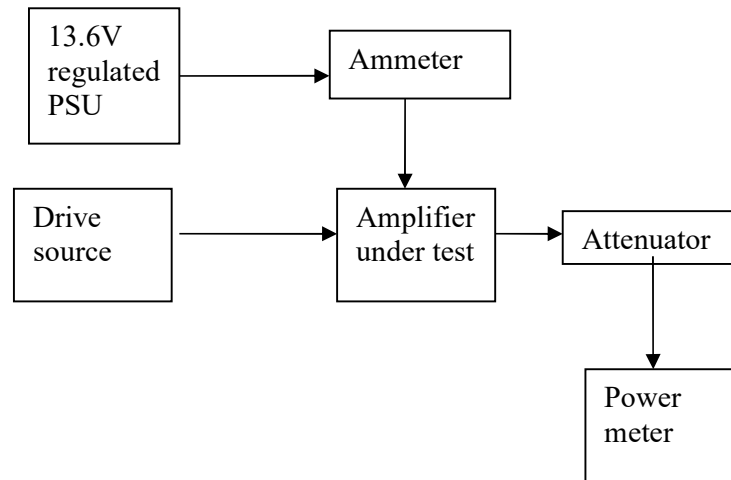
Solder the tab making sure that the solder flows under and round it and turn the board over and make sure that solder has gone down the tiny plated through holes but not excessively as this area needs to be flat to fit the stick-on heatsink. If solder has gone through use solder wick to remove it.

Fit the stick on heatsink, Fit R5

### **Recommended Test equipment**

| <b>Equipment</b>                        | <b>Example</b>                                       |
|---|--|
| Digital Multimeter                      | Any DMM that can measure up to 15 Volts and 1 Ampere |
| 10mW Drive source with adjustable power | Signal Generator or Low power transverter            |

|                              |   |
|------------------------------|---|
| 13.6V regulated power supply | Any   |
| 432MHz Power meter           | HP 435A, HP436 plus 30 dB attenuator.<br>Bird Thruline or Diamond SX1000 5Watt<br>dummy load. |



## Alignment

No RF alignment is required, you just need to set the DC bias on the device to give a drain current of 120mA without drive

Connect the input from your 432MHz 10mW source transmitter to the amplifier input. Connect the amplifier output to a power meter/ dummy load capable of dissipating at least 5 Watts. If you are using “flying coax leads” to connect rather than a box and connectors, there should be NO braid tail, not even 1mm. Use thin PTFE coax so that the inner does not melt and solder the braid directly to the convenient ground point close to the input and output pads.

### DO NOT CONNECT ANY DRIVE POWER YET

Be careful with R2, it's possible to increase the bias enough to destroy the device  
Turning the pot clockwise INCREASES the Bias current/voltage.

Connect the 13.6-volt supply via an ammeter to both the 13.6V supply and the PTT connection, on a low range such as 100mA. Starting with R2 set fully clockwise with minimum volts on the gate, VERY carefully increase the gate voltage until the device begins to take drain current. This onset is very sharp, so be very careful, as the drain current can easily swing up to many Amperes if you are heavy handed on the pot. Set the drain current to 120mA +/-1mA. This may rise by some 10-20mA as the device warms up, this is normal. Switch off the supplies and then switch the ammeter to the 1 Amp range. Switch back on.

Check all your connections, take a deep breath and apply the 10mW drive. You should see around 3 Watts out with around 400mA of drain current. Increasing the drive any further will just cause the device to saturate with no further output increase.

## Fault finding

There are only few components on the board, so there is little to go wrong, and fault finding is relatively easy. If you fail to achieve something close to the values in the previous paragraph, carefully inspect all your solder joints, and check that you have

not cracked or damaged any of the surface mount components or the FET. If you can get access to a microscope to do this, all the better! Recheck the bias current with no drive (standing current) It should not have changed by more than about 10-20mA. Measure the gate voltage without drive and it should be around 3.6 volts.