Some improvements to the G4BAO 2.5 Watt LDMOS Driver for the 1.3GHz band

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Introduction

Having just recently got a PE1RKI, 250W PA for EME use I found that due to a long feeder run, by the time the 23cm RF from my TS2000X had reached my dish site it was frustratingly about 1-2 dB below the 3W level required to drive the amp to full output.
I decided to see if I could generate the linear 3 Watts required using my 2.5W driver board kit (1) and then back off the TS2000X with attenuators.

Increasing Vdd

The PD85004 device used in the original design (2) is rated to 4Watts at 900MHz and a Vdd max of 40V. I found that with a 15V Vdd supply derived with a linear regulator from the main PA's 28V supply, I could get a linear 3 Watts out with 100mW of drive if I ran the driver standing bias Ids at 200mA instead of 50mA.
The Id increased to around 350mA at full output, an efficiency of about 60%.

Regulated bias and Driver on off PTT control

I didn't want to run the driver "on" all the time, and wanted the ability to switch it off under fault conditions. The PE1RKI PA is switched by applying a low current +12V supply on transmit, so to enable me to switch the driver from the same line, I added a small 5V regulator and capacitor to the driver board (Figure 1) by cutting a single track and scraping off some solder resist. The ferrite choke was desoldered at the supply end and connected to a feedthrough on the box for PTT bias input.
R3 was replaced with a zero ohm resistor. See Photo 1.

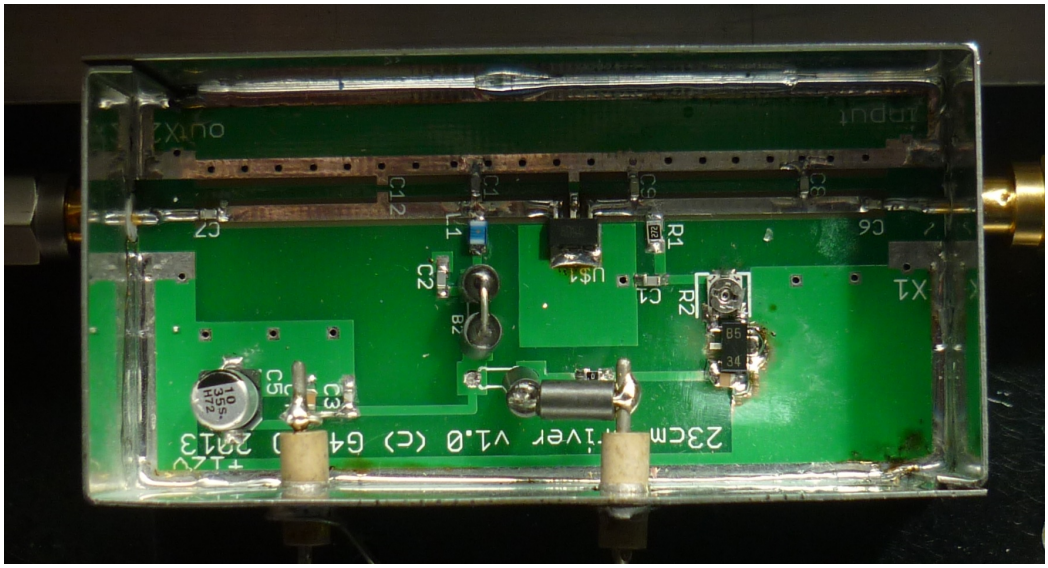

Photo 1 The added regulator and capacitor and moved inductor

The RKI amp produces an over temperature logic level of +5V when the amp gets too hot, so with some extra circuitry I now have a way to switch off the drive under VSWR fail conditions or overheating by disabling the driver's bias regulator.

Checking the completed mods

Connect the output from your low power 1.3GHz transverter to the amplifier input after first ensuring that the input power does not exceed 100mW (+20dBm). Connect the amplifier output to a power meter/dummy load capable of dissipating at least 3 Watts.

Connect the drain to 15 volts via an ammeter on the 1A amp range. Connect the gate bias supply, starting with minimum volts on the gate, VERY carefully increase the gate voltage until the device begins to take current. This onset is very sharp, so be very careful, as the drain current can easily swing up to many Amperes if you are not careful. Set the drain current to 200mA. Apply drive and check that the output power is more than 3 Watts with 100mW of drive at a drain current of around 350mA.

Conclusions

Increasing Vdd to 15V and adding a switched, regulated bias supply the G4BAO 2.5W driver amplifier can be made more versatile in 28V systems and produce enough power to drive a large SSPA such as the DF9IC or PE1RKI.

Revised circuit

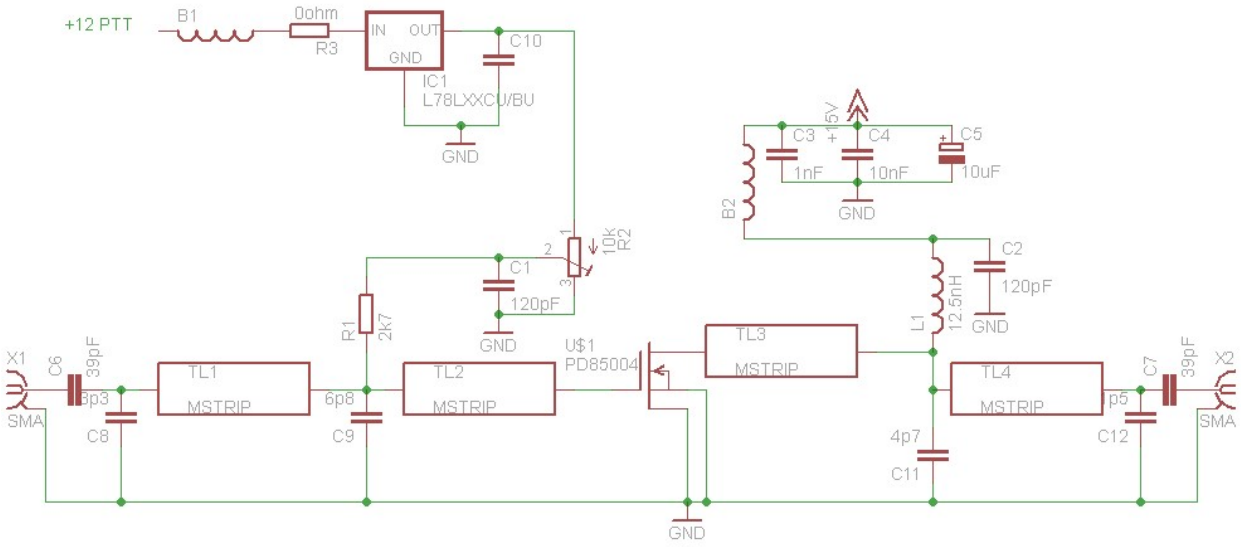

Figure 2 Driver with added 5V bias regulator

Table 1 – Added /changed components

Component	Value	Type
IC1	uA78L05	SMD PK package
R3	Was 2k7 now 0R	0805
C13	330nF	Murata ceramic 0805 or 0603

References

1. Original article:- http://www.g4bao.com/Files/23cm_D.zip
2. PD85004:- http://www.mouser.com/ds/1/389/CD00178461-55263.pdf
3. Unmodified kits can be obtained from the author. See www.g4bao.com for details.