

A Modest Power Amplifier for Cheap and Simple Microwave Transverters

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My Cheap and Simple Transverters for the Rover typically produce only a few milliwatts, enough for many rover contacts. Higher power amplifiers are available, but not always cheap, and often requiring significant DC power. If we could provide a bit more power without significant difficulty, expense, or DC power expenditure, it might enable more DX for the rover.

A number of devices might provide this power, but many of them would require tuning or more complicated biasing. We would prefer a simple MMIC like the other devices in the transverters, sticking with our design philosophy – gain is cheap. Minicircuits (www.minicircuits.com) offers several devices in a three-lead package with a ground pad capable of 100 milliwatts or so, all at low cost.

I chose the GVA-84, which requires only a 5-volt power and no bias resistor. The bias is supplied through an RF choke

I had room on a prototype Miniboard from Express PCB (www.expresspcb.com) for a small circuit with SMA connectors. The completed board is shown in Figure 1. It's simple enough that no schematic is necessary – just blocking caps, a chip inductor (30 nh) for the RF choke, and decoupling caps – but a schematic is shown in Figure 2 anyway. None of the component values is critical. There are several plated-thru holes under the ground pad of the MMIC which provide a thermal path to the ground plane on the far side as well as good grounding – this MMIC needs a small amount of heat sink, provided by the ground plane. The board needn't be this fancy; one could be cut with an X-Acto knife or Dremel tool, and the RF choke could be a few turns of fine wire.

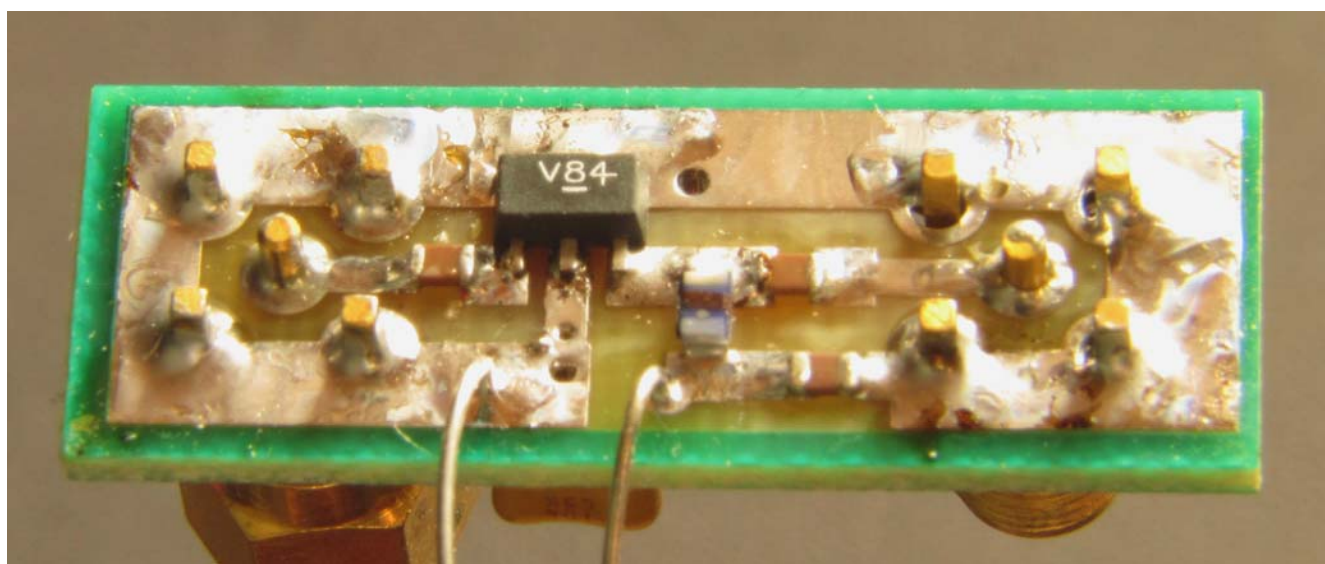


Figure 1- GVA-84 Microwave Amplifier

This simple amplifier worked as expected on all the lower microwave bands. The table below shows the output power with 0 dbm input as well as the saturated output power.

Frequency	Pout linear	Pout max
902 MHz	+19 dBm for 0 dBm in	>+21 dBm
1296	+19 dBm for 0 dBm in	+22.8 dBm
2304	+19 dBm for 3 dBm in	+20.5 dBm
3456	+15 dBm for 3 dBm in	+18.8 dBm
5760	+9 dBm for 3 dBm in	+13 dBm

The gain rolls off with at higher frequencies, but the amplifier can provide a modest power increase for all the simple transverters.

A similar device, the GALI-84, should provide similar performance, but requires a bias resistor, like other MMICs. This allows operation from higher voltages. The resistor values are relatively small, so an RF choke is still needed to prevent the bias resistor from absorbing most of the RF power. You might notice that the transverter boards have a ground pattern for the final transmit stage which would also fit the three-lead package – I've intended to try one, but haven't gotten to it yet.

This amplifier will also work at lower frequencies, but the capacitors and inductor would need larger values.

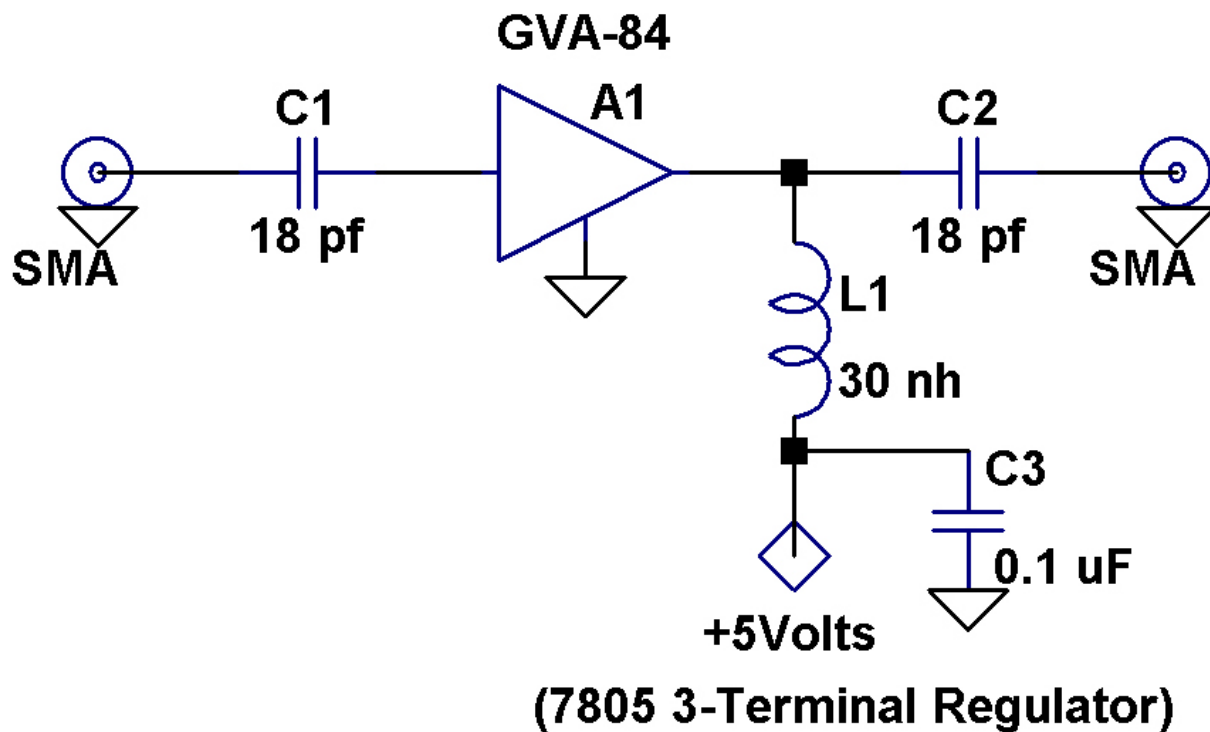


Figure 2 – Schematic Diagram