

Technicalities

**Ultra cheap, high performance PAs.
Super-regeneration
re-visited for 23cm.
By Frank Ogden G4JST**

Sitting here, bashing out this regular column, I feel that I must give the impression that everything I do works 100 per cent first time. This, I must assure you, is at least ten million miles from the truth.

In reality, it's hard slog with projects seldom, if ever, springing into life at switch-on. I must state though that if logic (of the thought kind) has been applied in the design, most things work eventually. Beyond the wiring of a main plug (99 per cent success rate) a new project will nearly always need some adjustment while I find that I am forever thinking of new ways to adjust old ones. The topics for the column this month are non working proof of fallibility.

An HF power device for 88p

Our *Project Omega* all mode HF transceiver system calls for the design of both a QRO and a QRP output stage. This translates to output power requirements of 100W and 5W respectively. Furthermore the linearity of the output stage must be flawless, deliver the rated power over the range 1.8 to 30MHz, if possible produce little noise in the output spectrum and, last of all, not cost and arm and a leg to build.

The obvious thing to do would be to press some of the 12V 2m FM transistors into HF linear service. They are relatively cheap and obtainable and very efficient over the HF band. Unfortunately, devices such as the 2N6084 are ballasted sufficiently to avoid 'hot spotting' on the silicon die but not enough for really good linear service.

They are also relatively fragile. The collector base breakdown voltage is low, and if exceeded for a long enough time, will surely result

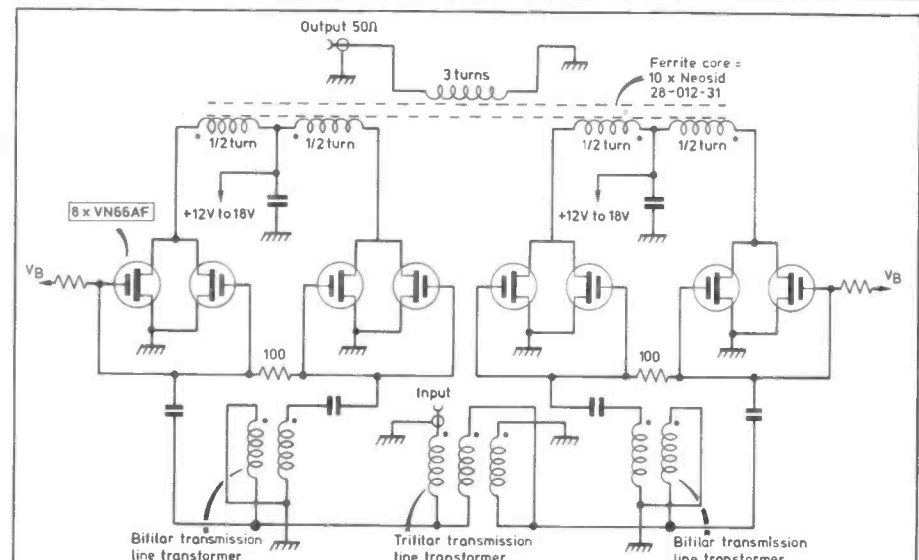


Fig. 1. 100W broadband HF amplifier. The total cost is around £12 but there are problems though. See text.

in device failure. Given the inductive transformer arrangements typically used in HF linears, the chances of an energy bolt smashing a junction to bits is very real.

There are a number of HF SSB devices on the market which are very robust but just look at the price. Quite ridiculous. My answer is to use gangs of cheap, plastic packaged MOSFETs in conjunction with power splitters, etc, to bring the total power up to the desired level.

I have given a 'for instance' in Fig. 1. Each transistor is a VN66AF power MOSFET costing around 85p each. Manufactured by Siliconix, the same basic chip is used in the company's stripline package VMP4. Individually, the transistors will pass up to 2A of drain current, stand off up to 60V across the channel and show similar RF characteristics to a bipolar transistor with an Ft in the 600MHz region. All in all, the basic chip RF specification is excellent although the device's plastic package does pose a few problems when you want it to do something more interesting than drive a print hammer.

Here is, roughly speaking, where I came in. I haven't got the eight transistor £12 HF amplifier to work properly yet. No matter what I

do, the wretched thing takes off around 70MHz and oscillates very robustly indeed.

This particular prototype has been constructed with the main output transformer consisting of two stacks of five ferrite ring cores each with two transistors at each corner. The two single turn primary windings emerge at opposite ends of the core stack to connect with the paralld drains.

I have had the design working briefly but the whole thing is unduly fussy about layout, and absolute symmetry of design is quite critical. The transistors themselves need either to be very carefully matched (you try getting eight the same!) or fitted out with individual bias pots which is a hassle. However, the possibility of a really good HF amp for next to nothing will keep my mind applied to the project and I will let you know the secret of successful design when I have found out myself. In the meantime, how about someone at the Siliconix Swansea application labs taking up the problem? Or anyone else for that matter. One thing is sure. Once the design is cracked, it is inconceivable that anyone would want to build HF gear with anything other than plastic packaged power MOSFETs.