Re: Diode recovery pulse generator

Source: http://sci.tech−archive.net/Archive/sci.electronics.design/2006−05/msg05418.html

- *From*: bill.sloman@xxxxxxxx

- *Date*: 30 May 2006 03:27:28 −0700

Tim Williams wrote:

> Ok, so if I understand the procedure properly, you are to charge a diode with some forward current, then reverse the terminals, putting it in reverse recovery, and when you have gobs of current flowing, and the charge carriers suddenly run out, and it says oh shit and makes a huge dI/dt and switches off. Or something like that.
>
> Well here's my circuit to test it.
> http://webpages.charter.net/dawill/Images/Diode%20Recovery%20Pulse%20Generator.gif
> Note the circuit is optimized for turn−on only (the 2N4401 output, without FET load, has a risetime of about 8ns, comparable to my signal generator, coincidentially), so repeat rate is pretty crappy (~200kHz).
>
> With FET, Tr is about 50ns. Er.. I forget if that's before or after Rg. Drain risetime is pretty spanking, of course.
>
> So, when the FET slams on, current in the two turns of hookup wire quickly rises, and the diode goes reverse... after some time, it plinks and the inductor discharges as a negative−going flyback pulse, after which the voltage falls further as the MOSFET saturates, then turns off and everything relaxes until the next bit of excitement.
>
> But the thing is, I went through pretty much all my diodes and the best I've seen is a pulse around 40ns across at the base (about 20V tall with supply as shown). I've got the best results from high speed damper diodes (1.5kV, <200ns trr, etc.), and the worst from power rectifiers (1.5kV, trr ~1us). Schottkies of course just ring (gimme a break, it's lashed up on a protoboard), with no RR to speak up the FET just slams on.
>
> Where's the 1ns shit everyone else seems to be getting? Step recovery diodes?

When I worked at Cambridge Instruments we used step−recovery diodes to generate 100psec snap−off steps to test our 0.5nsec long electron beam pulses in the stroboscopic electron beam testers.

We bought the step−recovery diodes from Hewlett−Packard via U.K. distributors, and drove them with an H−P pulse generator. I had a plan to make a pulse generator board with a couple of BFR93 (NPN) and BFT93 (PNP) wideband transistors driving a BFR96 output transistor, but never got around to it. The BFR93 and the BFT93 are still available from Farnell for about a $1.50 each. The BFR96 seems to have been superseded by things like the BFQ19 ($2.50)and the BFG97 ($1.0) and Farnell now carries the 8 GHz BFG135 ($4.5) which might be interesting. I always had to put a "base−stopper" resistor in series with every base − something between 22R and 33R to stop the parts oscillating at a couple of GHz.

I'd been using 5GHz bndwidth transistors for some time − see

Ghiggino, K.P., Phillips, D., and Sloman, A.W. "Nanosecond pulse stretcher", Journal of Physics E: Scientific Instruments, 12, 686−687 (1979).

which owes a lot to good advice from colleagues at EMI Central Research.

For sources of step−recovery diodes see

http://cp.literature.agilent.com/litweb/pdf/5966−4998E.pdf

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