

Re: Prototyping?

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- *From:* Joerg <notthisjoergsch@xxxxxxxxxxxxxxxxxxxxxxxxxxxx>
 - *Date:* Fri, 02 Nov 2007 16:59:34 GMT
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Joel Koltner wrote:

"Joerg" <notthisjoergsch@xxxxxxxxxxxxxxxxxxxxxxxxxxxx> wrote in message
[news:kGtWi.2430\\$yV6.1485@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx](mailto:news:kGtWi.2430$yV6.1485@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx)

Agreed. I breadboard only when trying to use parts in really unorthodox ways (happens a lot...) or when I need a one-off to control something and it doesn't have to be pretty. Beats the usual 1-2 week wait for fab, stuffing and all the Fedex in between.

OK... but say for something as "simple" as a UHF bandpass filter (say a standard ham band one... 420-450MHz, assume you've decided you need a 5th order Chebyshev filter to obtain the skirts you want), do you (or John) expect you can design and layout a working PCB without either...

433MHz is considered near-DC by some folks here :-)

Really steep resonances are frowned upon because now you rely on things such as cleanliness of surfaces, board materials and stuff, and that becomes dicey. Better increase the number of filter stages.

1) Performing simulation using one of the high-end CAD tools like Genesys, ADS, or Microwave Office, which can use very good models of the capacitors and inductors you're wanting to use as well as accounting for most parasitic effects of pads and trace width variation.

Nah, believe it or not, sometimes I even leave the HP11C in the drawer and pull out ye olde slide rule. It's faster in finding out how to design with catalog parts because you don't have an E96 series to pick from.

2) Fully intending to perform a fair amount of tweaking (generally of capacitor values, given the frequencies involved) once you actually build the board.

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If you expect tweaking you can provide either varicaps or PIN diodes and have them under host control. I try to stay away from any hand-trimming.

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I certainly can't do so myself, and if someone else can I'd love to learn their tricks! The fact that I've never read of such a method in amateur publication (books, magazines, etc.) suggests to me that it probably isn't doable... and the commercial guys just go with method #1 up there.

There are excellent books in the ham radio community on how to build UHF and microwave gear that actually works right off the bat. Mine won't do you or most others here any good because it's in German and I have no idea whether they ever translated it: K.Weiner's "UHF Unterlage", kind of a UHF and >1GHz compendium with lots of tricks on how to build this stuff when you only have a rather modest shop. I am pretty sure that ARRL and RSGB carry similar books on microwave design techniques in English. In contrast to university courses these teach you where to actually buy the materials and how to process them.

Method #1 up there becomes less costly over time, thanks to lots of online routines such as those of U of Missouri-Rolla. Many of these are just approximations but heck, it's usually good enough. A full-blown simulation will remain costly for some time but frankly I never had the urge to do so anywhere above 50MHz. Ok, I just did one at 400MHz for a client but that's the exception.

Trying to meet a customer schedule deadline, I've seen tens of thousands of dollars spent to do a quick-turn of a many-layer PCB containing relatively simple circuitry such as RF switches, splitters, etc... but going to, say, 3GHz. And I've seen engineers find out within no more than 15 minutes of receiving a stuffed PCB that their design doesn't meet some prescribed isolation or frequency response flatness requirement. I cringe, because I could have predicted before spending that sort of dough that there was no better than a 50/50 chance that it would have worked anyway. Now, from a business perspective at some point perhaps you can't increase those odds so you might as well spend the money anyway (a 50% chance of something working for, say, \$25k may be better than a 0% chance of something working for free and your missing a \$60k customer payment...), but what I've taken away from such experience is that one is better off going through *more* prototyping cycles *early on* in the project so that you hopefully don't have to fight such Pyrrhic battles in the first place.

You may have to ratchet up the "input path" a notch and move to luxury materials where parameters are more controlled. For example start with Rogers instead of FR-4. Later you can always back down but usually you want something that works, and fast.

Yes, I occasionally do prototype stuff at that frequency range when trying something unusual. Or when I want to try out that new chip and can't wait 1-2 weeks for populated boards to come back. But, thing is, what good does it do if you take a piece of nice thick silver coated wire, polish it to a spit shine with Wenol paste and get

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the perfect filter response? You've got to migrate that to a circuit board at some point and then you are almost back to square one anyhow.

Totally OT now: Are you guys up there also having a wood pellet shortage? I had to wait in line this morning because we finally had one (one!) flatbed truck coming in late last night. Only 28 tons, meaning after the first 28 pickup trucks it was gone. I can't believe it. Ok, at least I got my 1/2 ton.

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Regards, Joerg

<http://www.analogconsultants.com/>

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