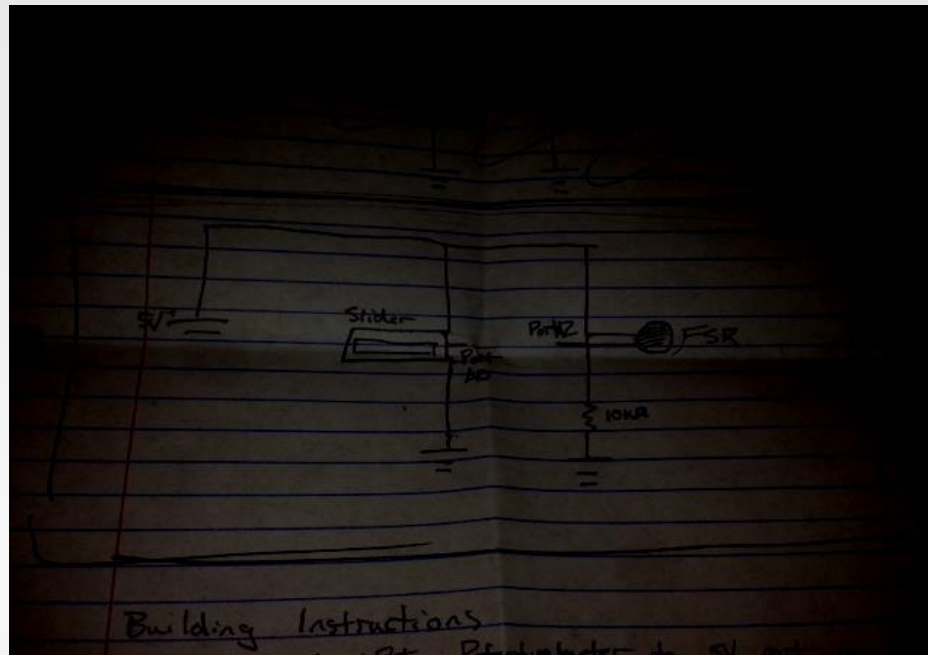


From Cryptic Scrawl to Breadboarding and Construction

□ Mike Malone KD5KXF

It all starts with an idea...

- And those ideas never happen in the ideal environment to be recorded, so you have to improvise sometimes...



Or it might be someone else's idea

- That latest thing you read about on one of your email reflector groups
- Or something you found on the internet or in a book
- Or in a publication such as QST

If it is a published design...

- It is ALWAYS a good idea to contact the author for any errata.
- Often times we can email designers of internet published circuits, and it is good to check with them for errata.
- Sometimes they even have yahoo groups or their own email reflectors for the project. Joining is usually very worthwhile.

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Parts parts parts

- After digging in your junkbox and determining what you have and don't have... you need to acquire the parts.
- Searching the usual sources... mouser... digikey... you can order them.
- You can look for them at local electronics part dealers if you are fortunate enough to have one.
- Put the word out at local ham club meeting. Sometimes you get lucky.

Parts substitution

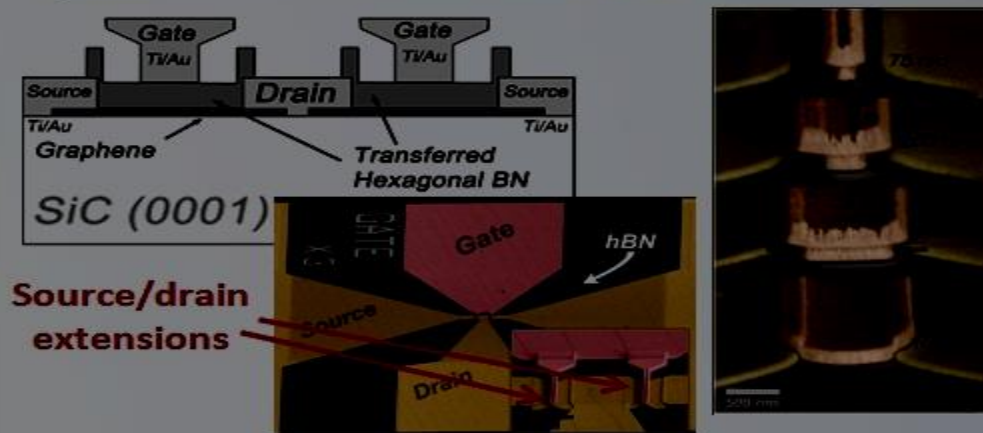
- If working with RF transistors, sooner or later you will have to substitute something. Parts substitution books are helpful, so are online spec comparisons with parts suppliers.
- Some of the older esoterica is still available through ebay and other online sources or thru expensive replacement companies such as JTE.
- Sometimes it makes more sense to change the design.

Consider other technology in substitutions

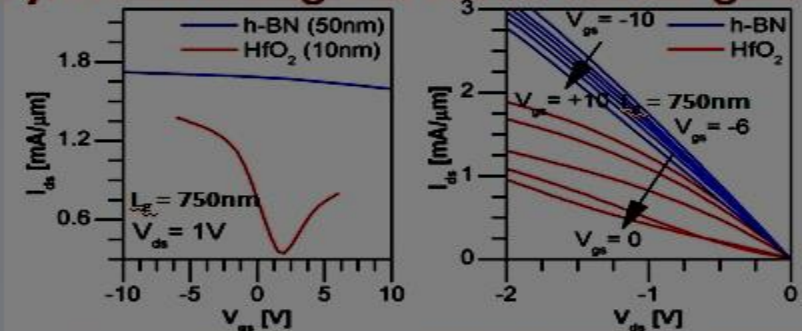
Graphene Based RF Transistors

PENN STATE Electrical Engineering Department

Goal Design and demonstrate a highly scaled graphene based transistor (GFET) which employs self-aligned doped source drain extensions, high quality graphene channel, low contact resistance metal-graphene interface, and high quality top-gate dielectric.

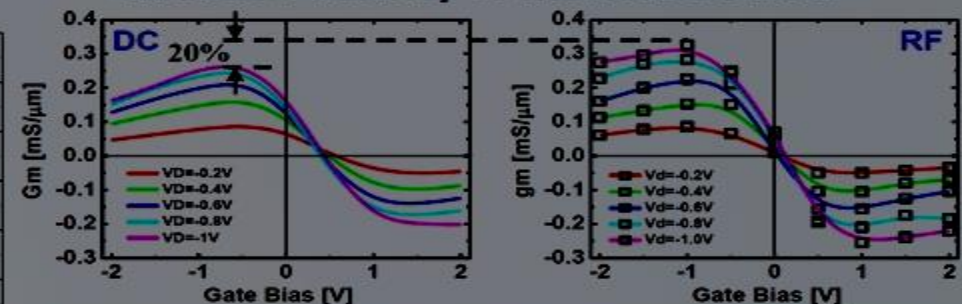
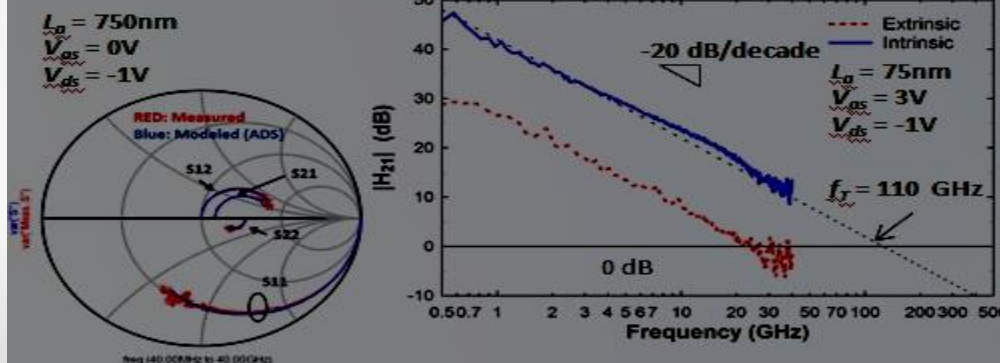


Synthetic hexagonal boron nitride gates



RF IV vs DC IV used to extract effective density of interface states

RF device performance



Graphene devices have the potential for unique, high frequency RF applications due to high carrier mobility, ambipolar behavior

**So I gathered these parts... now
what?**



Lets talk about prototyping and breadboarding

- Here is one way to mess with it if you aren't quite sure on values or want to play with it. This is not real good with RF though.

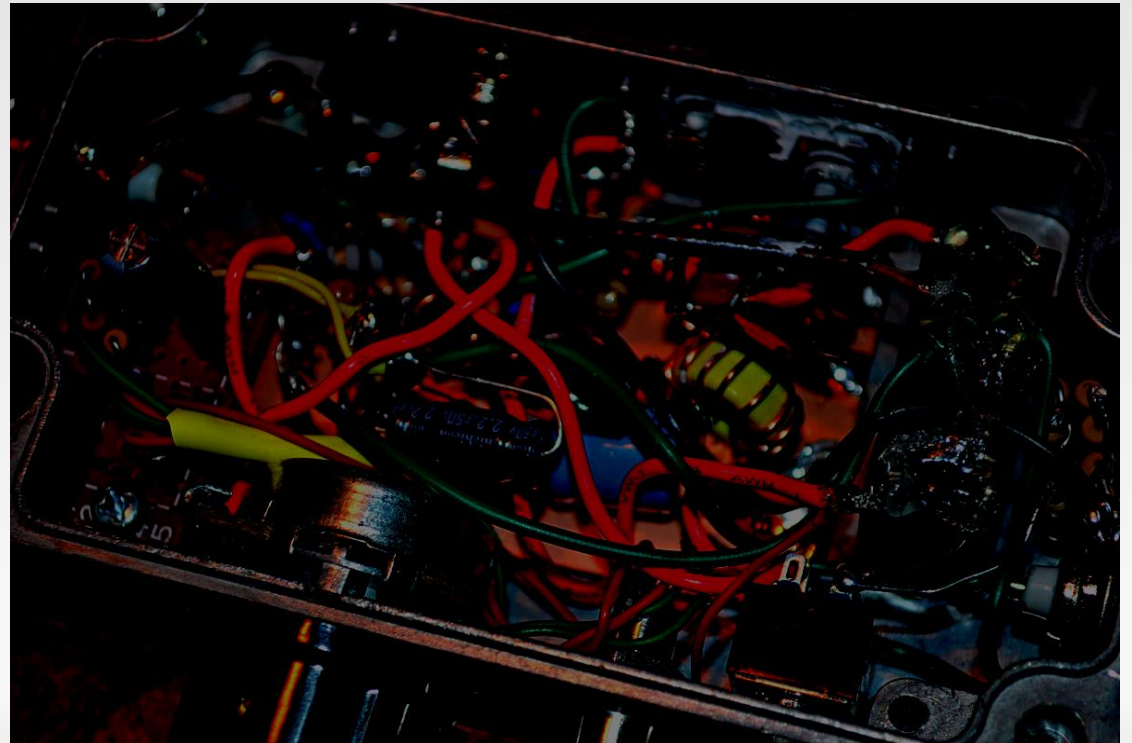
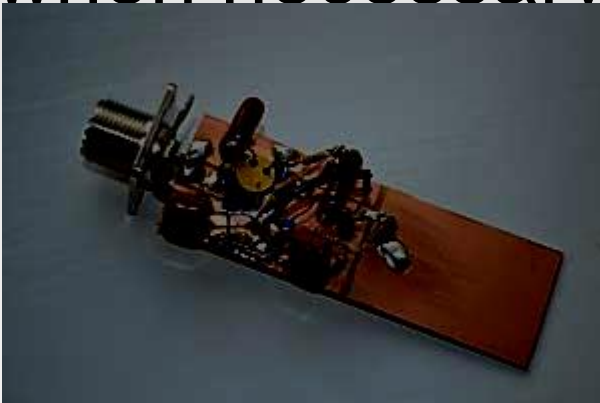


Solderless breadboards

- Are great for testing audio amplifiers and logic circuits... keyers and other non rf circuits.
- They are not so good when testing filters, mixers, oscillators and vfo's.

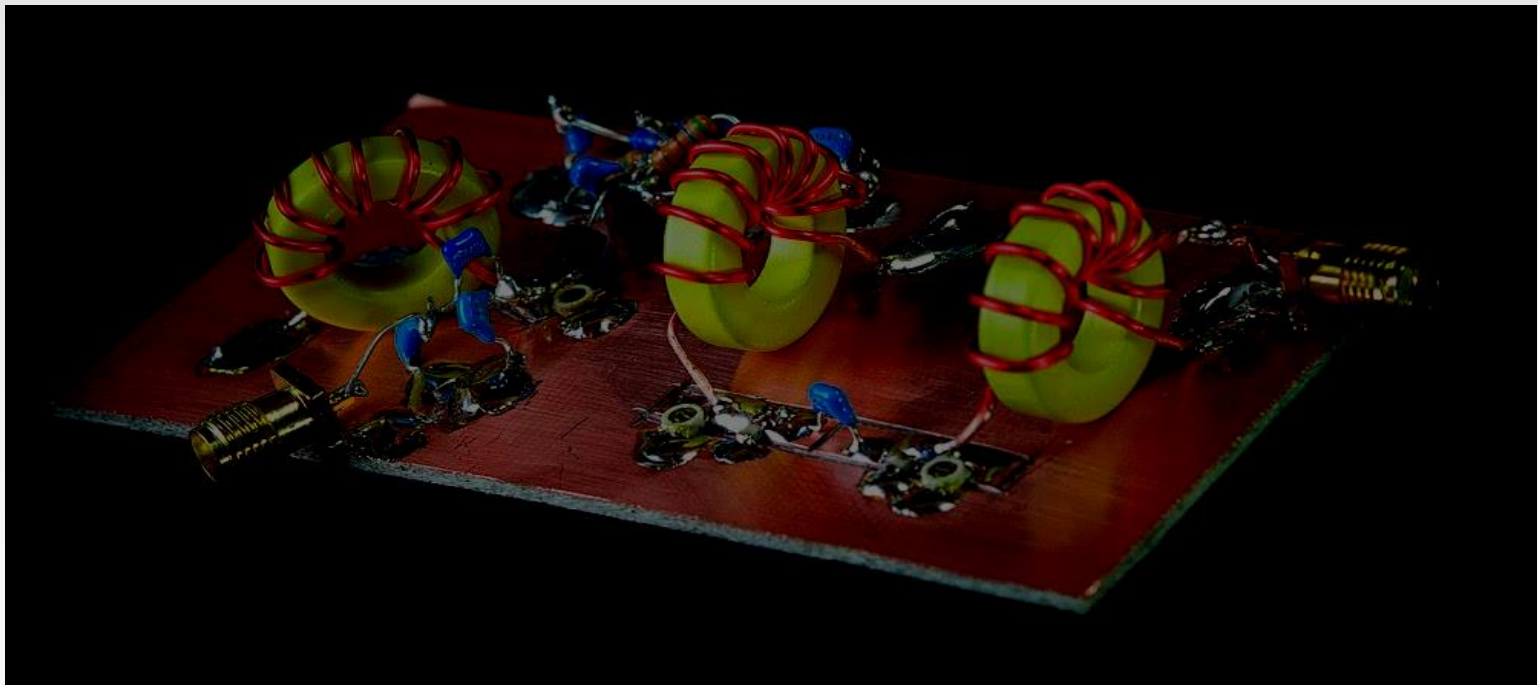
Prototyping RF

- Here is where ugly style and manhattan come into their own. They are easy to make changes in when necessary too.



Ugly style construction

- You can simulate having a true etched pc board by cutting pads in the board with an exacto knife... almost like manhattan.



Ugly style continued

- You can also use high ohm resistors to make standoffs on the board and build your circuits off the board.

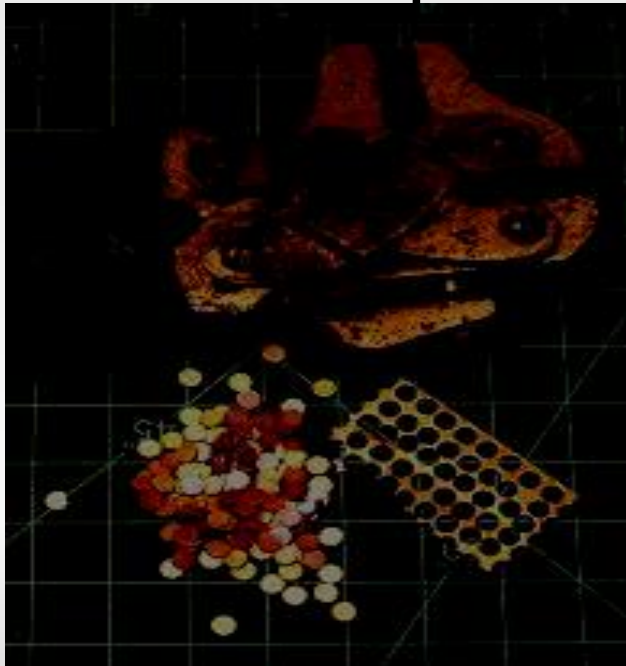


Ugly Style Hints

- You can glue your IC's upside down to the board and have the leads in the air. Grounded leads can be bent down to the board. The whole copper plane is ground.
- You can use 1.8 megohm resistors as standoffs to support non ground parts of the circuit.
- You can use terminal strips glued to the board to support other items.
- The key to ugly style is to be creative and work quick and dirty.

Manhattan Style Construction

- Manhattan revolves around super gluing copper pads to a copper board and the board still remains ground while the pads are taking the place of isolation pads cut into board, standoff resistors, or terminal strips of manhattan.



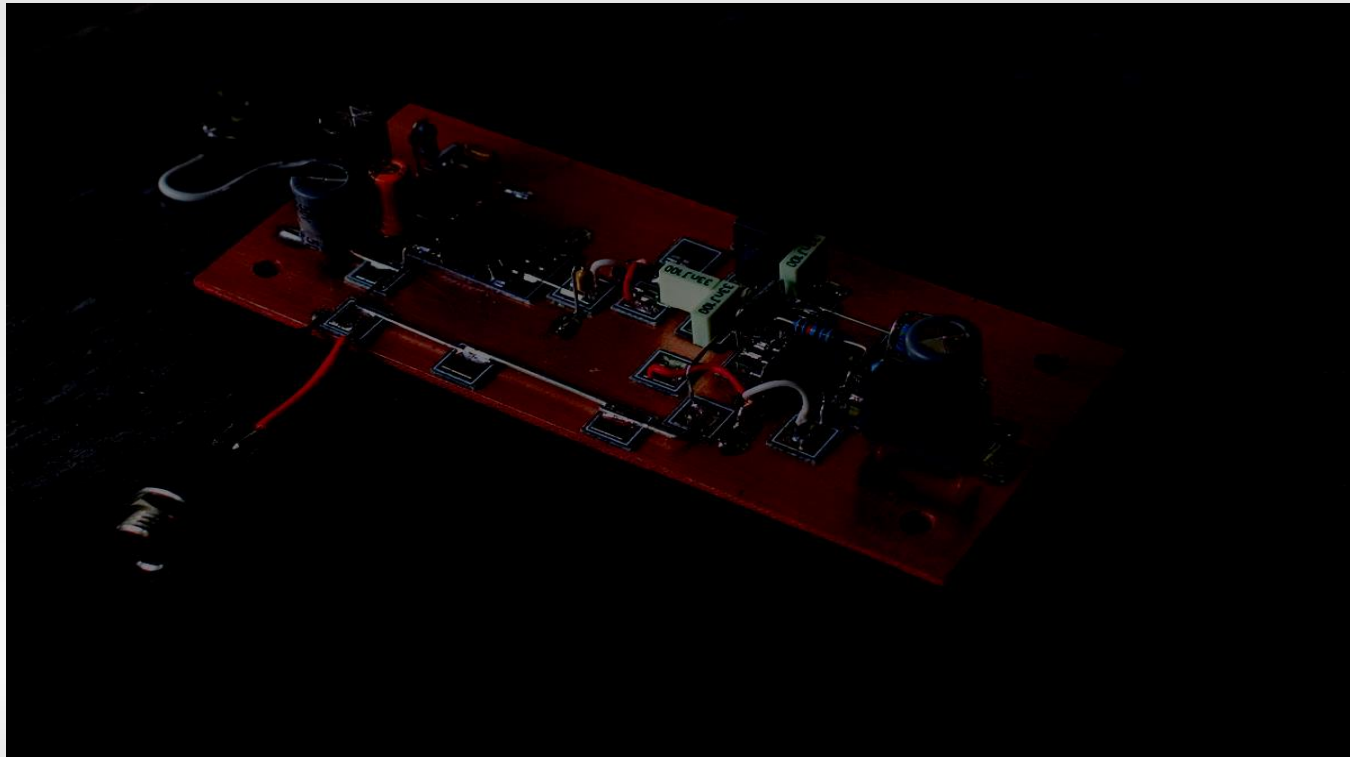
Cutting those pads

- The Bear punch is popular and makes nice pads.



Pre cut pads are available

- The ME Neatpads from QRP ME make a very good looking project and ic pads are available too...



Gluing down those pads

- When first starting construction, it is helpful to figure out some dimensions of parts and figure out how large a copper board to start with. You can also build each modularly putting each block on it's own board.
- When you are ready to start, glue down your pad with superglue, let it set for 10 seconds, holding it down with pliers and then take your soldering iron and tin it. The heat from the iron will complete the superglue bonding process.

Use Caution with the FUMES!!!

□ Just ask this guy!



Some tools of the trade

- Gridded paper will help with the design. These pads were cut with a paper cutter.



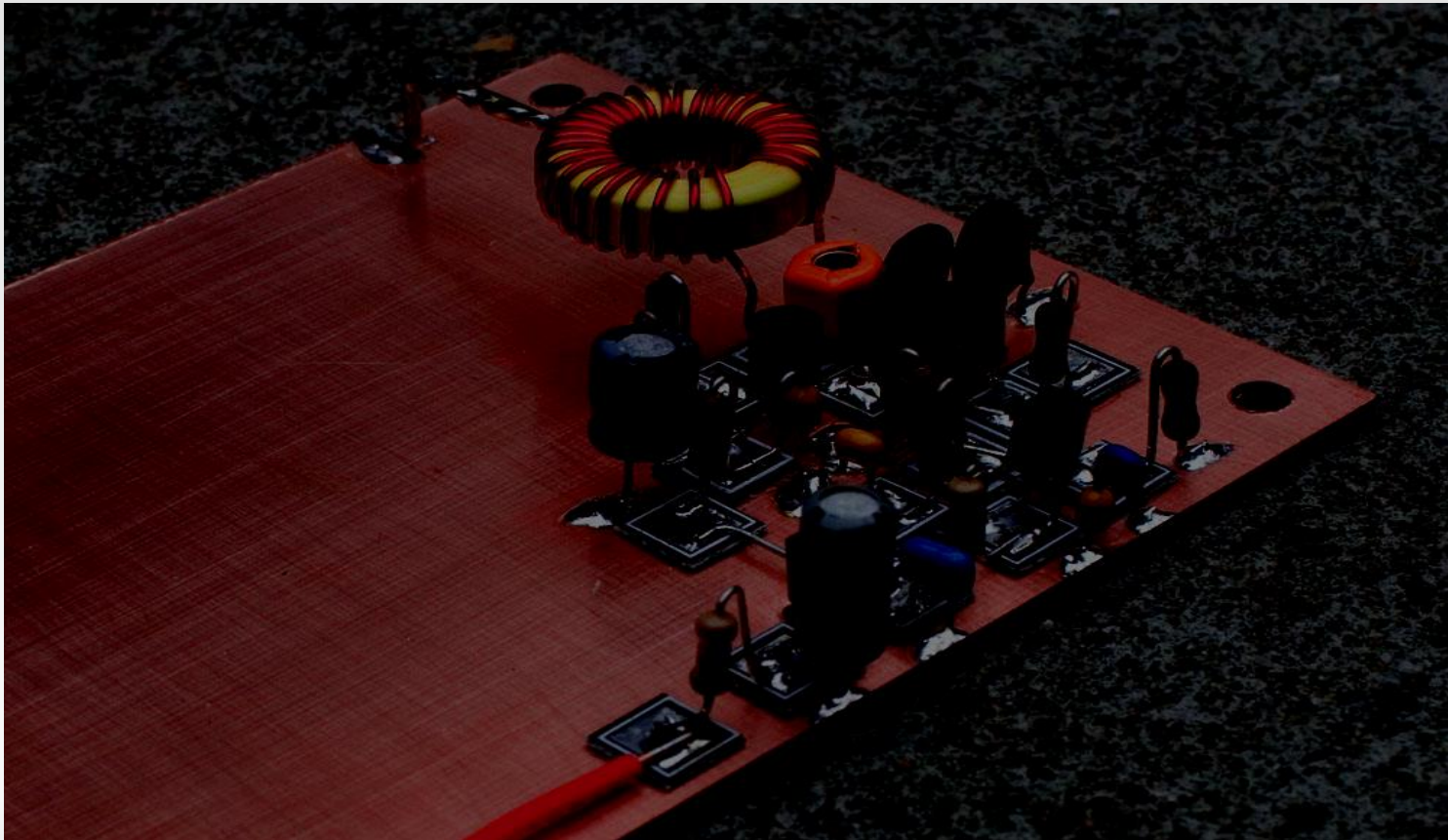
The sharpie

- See how the circuit is being designed and parts being notated on the board?



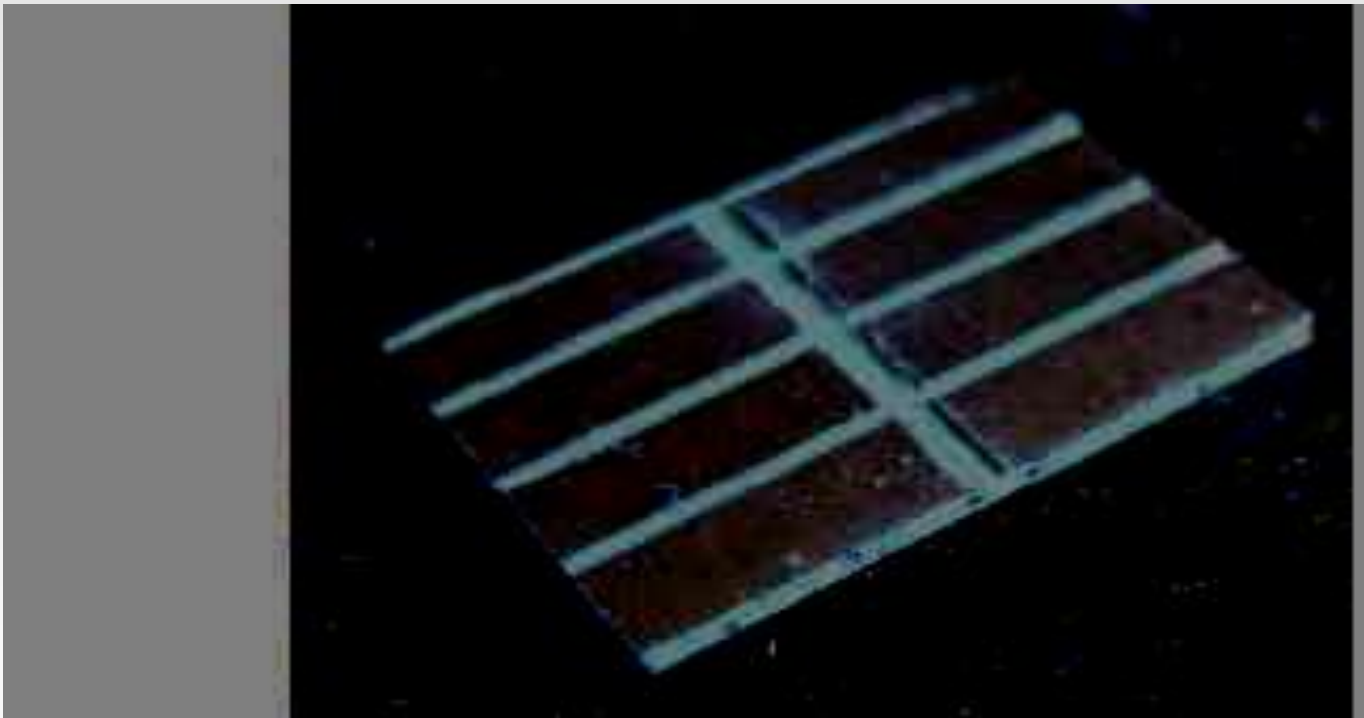
Manhattan can be built very neatly too...

- Very pretty isn't it? It isn't mine.



What about those IC's?

- There are pads for that or you can glue the ic to the board upside down. Be sure you mark pin 1!



Making IC Pads

- Hacksaw or needle files can be used to make them. Check isolation of each pad to avoid hard to trace faults later.
- You can also get pre made ones from Rex at QRP Me



Some suggestions for prototyping

- Build in modules
- Unless the project is very simple, break it down into functional blocks such as amplifier, oscillator, etc...
- Include any power supply items as its own block.
- Test as you build and stop if a module is not working. It will not miraculously work when you finish it so you may as well do it now.

Start small

- If you are inexperienced, start with something simple like an audio amp for your cell phone or qrp rig.
- If you are not figuring out the circuits you build, this is just soldering practice.
- Build a reference library... ARRL Handbooks, component catalogs,

The tools necessary for this...

- Soldering iron and stand
- Solder
- Needle nose pliers
- Flush cutters
- Wire strippers
- Snips or similar if cutting pads
- A multimeter
- Decent light to work in

So my idea has been prototyped...

- Congratulations if it works... now you can modify it, hack on it some more or call it done and put it into a nice case.
- Would it make a cool club project? Maybe others in your local ham club would enjoy building it. Group builds are fun and cheaper.
- Maybe you want to make it a kit. Now the decision

Should we make a printed circuit?

- If you decide to do so, look for people in your club that do this. Even if you want to learn to do it, getting some help and hints is always good.
- Prepare the files
- Have a test run of boards made before you go for 100 or 200 if it is a fairly complex project and build a few with the very components you will use in the kits. Beta building is a necessary step.

And remember

- Sometimes our rf projects work a lot better when we build manhattan or ugly because of the large rf plane.
- Be sure you are not miniaturizing it too much when you design the pc board and are keeping the same separation of blocks that you did with your prototypes.

Open Forum

- Let's talk and take questions. I have kept this presentation very open framework so we can address what you really want to know.



If you have further questions

- My email is kd5kxf@gmail.com
- Please exit the room in an orderly fashion...



That's all Folks!