

sdmay20-39: High Speed Magnetic Field Generator**Week 9 Report**

February 14 - February 27

Team MembersJason Cheng — *Technology Lead*Ben Colson — *Test Lead*Zach Higgs — *Project Lead*Harel Cohen — *Hardware Lead*Craig Philipp — *Communications Lead***Weekly Summary**

This progress period was focused mainly on reorganization of systems and finalizing design for our MOSFETs and drivers to be put into our PCB, which will be ordered in the coming period. A focus on testing the systems and predicting their behaviors for use in the final PCB was necessary for this week in order to meet our revision 2 ordering deadline.

Past Week Accomplishments

Organization was a big focus in the past week. We realized that we had not tracked our previous revisions as well as we should have, and had not kept a log of switched parts or MOSFETs that had been tested in order to not visit them in the future. To remedy this, we are both organizing parts we currently have, and tracking inventory in a spreadsheet. The spreadsheet is shown (in a picture due to formatting issues) below.

TO ORDER	Part #	Description	Quantity currently in stock	Link
	EMK107BBJ106MA-T	10µF ±20% 16V Ceramic Capacitor X5R 0603 (1608 Metric)		Link
5	T495D475K050ATE275	4.7µF Molded Tantalum Capacitors 50V 2917 (7343 Metric) 275mOhm		Link
	833-1N4004-TP	Rectifiers 1A 400Vr 280Vrm 400V 30A 1.0Vf 5.0uA 15pF		Link
2	R12P22005D	Isolated Module DC DC Converter 2 Output 20V -5V 50mA, 200mA 10.8V - 13.2V Input		Link
	SSM3K15F.LF	N-Channel 30V 100mA (Ta) 200mW (Ta) Surface Mount S-Mini		Link
5	T491X107K025AT	100µF Molded Tantalum Capacitors 25V 2917 (7343 Metric) 300mOhm	1	Link
5	SIRA28BDP-T1-GE3	N-Channel 30V 18A (Ta), 38A (Tc) 3.8W (Ta), 17W (Tc) Surface Mount PowerPAK® SO-8	1	Link
	ERJ-8GEYJ510V	51 Ohms ±5% 0.25W, 1/4W Chip Resistor 1206 (3216 Metric) Automotive AEC-Q200 Thick Film	9	Link
	PWR163S-25-R100FE	100 mOhms ±1% 25W Chip Resistor TO-252-3, DPak (2 Leads + Tab), SC-63 Automotive AEC-Q200, Current Sense, Pulse Withstanding Thick Film	3	Link
3	PSMN8R3-40YS,115	N-Channel 40V 70A (Tc) 74W (Tc) Surface Mount LFPAK56, Power-SO8		Link
5	SIRA18BDP-T1-GE3CT-ND	N-Channel 30V 19A (Ta), 40A (Tc) 3.8W (Ta), 17W (Tc) Surface Mount PowerPAK® SO-8		Link
	5 SMA Connector	SMA Connector Jack, Female Socket 50Ohm Board Edge, End Launch Solder		Link
	5 1727-1232-1-ND	N-Channel 30V 95A (Tc) 64W (Tc) Surface Mount LFPAK56, Power-SO8		Link
	5 TPH3206PSB-ND	N-Channel 650V 16A (Tc) 81W (Tc) Through Hole TO-220AB		Link
	5 LM5111-1MX/NOPBCT-ND	Low-Side Gate Driver IC Non-Inverting 8-SOIC		Link

This will allow us to easily transition rejected parts into a separate sheet which we have, and keep a running total of what parts we have, and what to order. In a similar vein, we have purchased part boxes so we can keep all of our parts neat and organized, ready for our second revision.

Our other big task these past weeks was to finalize testing. We breadboarded the last MOSFETs we had on hand, as well as a gallium MOSFET. We unfortunately realized using the MOSFET without the driver produces a lot of ringing in the signal, which is also present with the driver. To solve this, we've developed a plan to isolate the driver and the MOSFET in order to try and get the driver to switch without using the load present in the full system. In addition, the parts we are currently using have different footprints, meaning the Altium and testing files have to be updated, and the full git repo should be better organized, as it is still left in a single revision state. More revisions requires splitting apart the common files and creating the capacity for more organization.

Pending Issues

- All git changes need to be pushed
- Ringing is still present in the signal; driver needs to be tested with minimal load
- Revisions need to be finalized to order the next revision
- Organization needs to be finished to prepare for making next revision

Individual Contributions

Team Member	Contribution	Bi-Weekly Hours	Total Hours
Jason Cheng	This period has mainly been dedicated to organizing the virtual systems, fleshing out the new Altium parts, and finishing testing finals so that we can easily drag and drop desired parts after testing. I will later use these parts to create the new revision. I also helped organize the spreadsheet, filling out prior used parts, and finding quantities so we know what to order for the testing, and what to order for the next revision.	12	124
Ben Colson	Tested gallium driver and measured signals in order to better figure out the chemistry's effects on the output signals. Helped go through documentation and previous notes to fill out spreadsheet and document previously used parts to avoid double using or testing previous rejected MOSFETs.	10	108
Zach Higgs	I helped go through all of the parts in the office for inventory and trying to figure out how we can organize the parts. I also helped sort everything out for future testing. In the world of testing, I helped breadboard the gallium driver and MOSFET to find resulting signals to test the feasibility of switching the current silicon-based solutions with something that is theoretically better. Will start preparing our future revision.	10	120
Harel Cohen	This week wasn't too productive due to a few tests and homework assignments. But we managed to organize all our items. During some of our meeting I brought in the idea that due to how difficult it is to find our parts in the lab, some people have a hard time going in by themselves to work on the project without someone who knows where parts	10	126

	are. Craig seems to have taken care of this and brought a box we can use for storage and organization.		
Craig Philipp	<p>In the past two weeks I have mainly begun preparing for the upcoming few weeks. I went through the office (with Zach) and found all of the parts that we currently use on the board and consolidated them into a board box. All of the main parts (excluding common components) are now in the board box which is labeled with our team name and the parts inside are labeled. This will be helpful as we tend to spend a lot of time searching for our parts because they are mixed in with others parts in the office. I also sent out our BOM to be ordered by ETG so we can have parts coming in for the next week or two. I also assisted with some testing of the driver with the Gallium MOSFET, there was a lot of ringing in the signal so we are going to be trying to get the driver to switch without using our inductive load and then go from there. For this Thursday I plan to help test the gallium mosfet again along with the old one and see if the issue was due to the Gallium as opposed to an issue with the driver.</p>	15	139

Plans for Upcoming Reporting Period

- Finish testing isolated GaN parts without load
- Start designing second PCB and removing excess traces
- Order testing parts to finish testing with all real parts before board order
- Finish spreadsheet and parts inventory
- Start reports for IRB