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# Design Review: Team 01

### Note to self:
Schedule DR with Nic for 6-6:30 tomorrow
DR with Nathan's team tomorrow at 7:30

### General Notes:
Brad was 2 minutes late to Team 04's DR 😡
Brad's doing a really good job 🥰🥰

### Team 04 DR:

### Schematic:
- Where are the contact points?
    - The contact points will be on the outside face of the die.

- Have we considered a weighted/rigged die?
    - It will most likely be loaded since we haven't been prioritizing weight. We are thinking of ideas currently for how to weight it properly, maybe with steel bearings.

- Have we considered just having a dense center of mass?
    - No, not really.

- What bus is going between the microcontroller and the gyroscope?
    - 4-wire SPI because the 3-wire SPI was harder to implement.

- Is the IC for the Accelerometer/Gyro one or two ICs?
    - One IC.

- Are we planning on playing tunes through a regular Piezo speaker?
    - Yeah, it'll most likely be kinda 8-bit, like a sequence of notes or something, nothing too crazy. We have to consider power usage here as well.

- What's with the PWM on the Piezo input signal?
    - No volume control, using an analog pin to vary it, and if that doesn't work we'll use a digital PWM.

- Is the plan for the Piezo speaker to have a summary volume - no user setting?
    - No plan currently for user settings.

- Will the enclosure be set or is it openable by the user?
    - The enclosure will be press-fit. We're hoping the 3D housing muffles the volume of the speaker somewhat since they are typically pretty loud. We haven't fully experimented with it yet.

- Do we have any plans for shock absorption for protecting soldering junctions and the PCB itself?
  - We don't have solder joints for the battery or LED needs, we're using JST connectors that lock together. So for the most part those wires shouldn't come loose or be impacted. The PCB will be attached in such a way that it won't move around freely within the enclosure. We'll be testing this rigorously when we have a PCB to put into the enclosure.

## PCB:
- Acid traps a concern warranting a potential change.

- If we make changes for acid traps, will we have issues with overlap?
  - No, not really, it shouldn't be an issue.

- To keep it small enough so that we didn't have to build the world's largest LED20, were you forced to use the back side of the PCB?
  - Yes, that's correct. We were slightly concerned with the thickness or height of our board when making this decision, but we measured everything out and it should be good to go.

- Are we doing a refill on the backside for our microcontroller?
  - Yes, as much as we can get away with it.

- Since we're on an SPI bus, are we going to try and set it up so we increase the size of the packet when doing a temperature reading?
  - Yes.

- Is it an option to concatenate blank temp data so we can keep the size the same without having to write to our config registers, or is that not something worth looking into?
  - We can queue transactions and then do a bunch at once, and toggle whether or not to do a temperature transaction. It can do all transactions at once, or 4 or 5 at a time, and report back data all at once, and then we can parse it.

- Was the gyroscope/accelerometer set to be off-center on purpose?
  - It doesn't matter where it is. We were just trying to make everything fit since we're so space-constrained. We could probably put it in the center, but it's not an issue at the moment.

- As far as battery consumption goes, what are we doing to lower the power consumption of the microprocessor?
  - Everything is interrupt-driven, our two states are active and inactive. After enough time being active, it will switch to inactive. Int1 and Int2, SMD on Int1, Int2 for wake/sleep. However, SMD is for steps/counter so it's not beneficial. Currently, Int2 is sending a logic high when it is inactive, and a logic low when it is active.

- Is there anything we can do to stop it from going into active mode when it's in someone's backpack or car or something?
  - The way we get around that is to set the threshold high enough so that smaller motion doesn't switch it into active mode. The other option is creating a deep-sleep state, only able to be triggered out of with a much higher threshold. We currently don't have a way to

turn it off when it's enclosed in the die. Looking into deep-sleep state options. Ideally, we could have a power switch, but it's hard to do without interfering with the face of the die.

## Extra:

Brad: Do you have any thoughts on additions?

Nathan: My big thing is it seems like we knew we were gonna skew the probabilities of the die which it seems like you kinda hand-waved a bit.

Brad: We'll try to resolve it.

Nathan: Stock bullshit answer. Probabilistic modeling, doing a bunch of testing, etc. Wireless charging would be cool too.

Brad: In general, it's inefficient. There's also a size restriction issue with wireless charging we were concerned about getting right.

Chris: Greenburg is also concerned about radiation.

## Nic Redfield DR:

- Widen traces to at least 12 mil (0.305mm) We've got lots of extra ground beneath the accel/gyro to play with, he also suggested adding a via in the middle of the accel/gyro and routing pin 13 to it, taking it to the front and finishing the route that way. This will allow for more room to widen our traces since they're currently crowded around that area.
- The aperture size for the silk screen is okay based on OSH Park's request