

# Design Review

17 April 2015

Powerpoint

Overview of the presentation

Specifications:

- Charge in two minutes
- 5..33 W/H – 7.2 W/H
- 65 F +/- 5 F
- Small enough to carry in backpack or other carry on

Make specifications as an inequality

Needs:

- Ordering parts still
- Working with cadence, analysis
- Working on making a prototype to test

Constraints:

- Biggest factor is time
- Obtaining parts
- Creating an accurate model
- Learning tools
- Eagle should be under learning tools
- Model should be a functional model, practical, can be easy to put together an impractical model

Deliverables:

- Charger
- Report documenting design of device

Project Learning:

- Research Meetings
- Personal Stuff
- Lead Instructor/Technical Advisor Meeting

Research Meeting:

- Looking to replace resistor divider to make it more efficient
- Number Slides for presentation
- Want to do a transient simulation, steady state will not be useful
- Would need to do a power factor correction to mass produce
- Need something there to see what the issues are
- Once it is full should have an indicator to signal this

#### Personal Research:

- Greatest benefit is the schematic found
- Secondary board
- Choosing to use two boards instead of one

#### Lead Instructor/Technical Advisor Meetings:

- Discussing parts of the project

#### Project Design:

- Adafruit
- iWatt
- Apple Charger
- Resistor Network
- LLC Resonant Converter

#### Adafruit Design:

- Slow charge time

#### iWatt:

- No guaranteed lifetime for device
- Has all parts listed with manufacturer

#### Apple Charger:

- Not many parts listed
- High power factor is very convenient
- Charger
- Has nicely regulated flyback converter
- Find manufacturer notes for chip
- Might need break up simulation

#### Resistor Network:

- Cheap and easy to design
- Inefficient
- Generates a lot of heat

#### LLC Resonant Converter:

- More efficient
- Contains protection circuitry
- Size challenges
- Check for negative version of this
- Identical second winding on transformer, ground upper terminal now have negative
- Not going to have adequate information to simulate going to have to design ourselves
- Don't waste time searching for parts if swag factor will work
- Make simulations/circuits work for us, don't work for them

### Suggested Design:

- Apple Charger
- Ideally would like to use LLC Resonant Converter
- Cadence schematic

### Project Costs:

- Small changes have been made, but mostly the same
- 600 W converter - \$200, looking for other options
- Caps listed are for smaller version of design
- 120 to 5 should be 30 to 5
- 120V AC

### Timeline:

- Want to make sure capacitor bank and other parts of front end are working correctly
- Cadence simulation will give the right idea of currents
- Need to look at time constant
- Will be changed to be more specific

Should use engineering judgement

### Potential Problems and Risks:

- Want to have parts ordered before end of summer so that they are here before we get back
- Want to get protection circuits involved
- Look into crowbar circuit for front end, see if this is feasible
- Series diode for switch

### Questions:

Why is there a capacitor to right of diodes on schematic?  
Concerned what will happen if capacitor is taken out

What does it do for us?  
Holds voltage for rectifier

Why are we concerned about small capacitor compared to large capacitor bank?  
Probably won't make a difference to get rid of it, want a current limited thing, Phone does not need to be there when capacitors are filling, If stuff around diodes is affecting pf, then they should be kept, otherwise don't necessarily need it

Take this thing one shot at a time, get first part running, then keep moving, easily splittable

Keep the main thing the main thing, think about what it's doing before copying  
Helps with figuring out what to safely ignore