CBL Wireless Energy Transfer – Tips and Tricks:

Author: G. Tibola

- **Datasheets – Do I need them?**

  - Yes, you do need to study and understand fully all components you are about to select in your design. You can find info on Google or directly in the supplier of the component by using the order code provided in the components list. The 4 suppliers used are:
    - Farnell: https://nl.farnell.com/
    - RS: https://nl.rs-online.com/web/
    - Conrad: https://www.conrad.nl/
    - Digi-Key: https://www.digikey.nl/

- **Power MOSFET and Power Diodes – Burn?**

  - These elements must be carefully designed since they are the main elements to process the energy, be sure they hold voltages and currents
  - They will have losses, so be sure to dissipate them (heat sinks)
  - Heat sinks design must be done according to the available heat sinks and theory (search & study)
  - Heat sinks use precious space in the PCB, but must be there, so be aware of that space

- **Sensors – Where?**

  - You will need to have sensors, plan where and which type, and check the available options
  - Current sensor usually requires extra components to work properly and special auxiliary voltages
  - Plan connections for those voltages and check what is necessary for the PCB
  - You will need to measure (with an oscilloscope) currents and voltages, plan where and how

- **Wires, connectors, etc. – Mess?**

  - To avoid mess and complications keep all cables and connections organized and labeled when possible. By doing that it is easy to debug problems, and it guarantees that the converter will not collapse, break or fly
  - There are specific options for wires used in the wireless coils, details are below:
    - **Option 1:** Rupalit HF Litze V155 (140 x 0,10mm). That means it has 140 strands of wire 0.1mm (AWG 38). For data on the single strand use the table provided on Canvas files or this website: www.rapidtables.com/calc/wire/awg-to-mm.html The outer diameter of this wire including all isolations is approximately 1.48 mm.
    - **Option 2:** Rupalit HF Litze V155 (105 x 0,10mm). That means it has 105 strands of wire 0.1mm (AWG 38). The outer diameter of this wire including all isolations is approximately 1.3 mm.
  - A few options to build the inductors/transformers are available as well, look at the part numbers
  - For general use, you can build your one with banana plugs, or simply using screw connectors. To have a better idea visit the lab to see the options available. A bunch of scrap wires and cables will be available for use and tests. For special requirements make a list of requests.

- **Inductors and transformers – Design?**

  - Find and study the “product of areas” approach to designing inductors and transformers
  - Make scripts to design the inductor/transformer
  - Only a few options of cores are available, select one, and make all calculations to be sure it will fit
  - Check datasheets of the core and the material of the core for the design
  - For PCB look at the datasheet of the coil form
  - In case the layout becomes difficult or late due to magnetic design, you can place the inductor outside the PCB and connect through connectors (Terminal Blocks)

- **Capacitor types and applications – Selection?**

  - How to select? Too soon to tell you! Study, think together, and decide, below are some hints:
  - Electrolytic capacitors
    - Highest capacitance per volume
    - Only for DC voltages (polarized)
    - High losses for AC signals
    - Typical applications: DC-bus capacitor
  - Plastic film capacitors
    - Lower capacitance per volume than Electrolytic
    - Non-polarized
    - Lower losses than Electrolytic
    - Typical application: Resonant circuits
    - Typical application: Parallel to Electrolytic to reduce AC losses
  - Ceramic capacitors
    - Lower capacitance per volume
    - Non-polarized
    - Lowest AC losses
    - Typical applications: Decoupling of supplies of integrated circuits

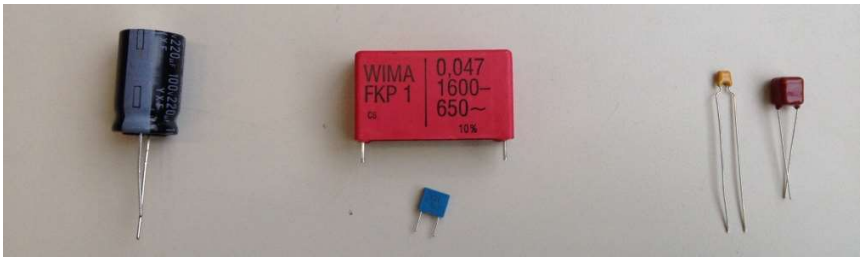

Figure 1 – From left to right: Electrolytic capacitor, plastic film capacitors, ceramic capacitors.