

Application Note

Debugging Process

Debugging is a tiring and boring process. It takes many patience and hard work to completely figure out where the problem is at. This document will introduce you how to debug any circuit including PCB and electrical circuit.

Debug Procedure:

The following procedure can be apply to any circuits for debug:

1. Check the power supply and make sure the ground is a common ground.

For many times over the course, we have forgotten to plug in the power and to ground all the components properly. It is really important to make sure you have power and ground connect properly.

2. Check for connectivity on the PCB.

When we soldering our PCB, we have failed many time to properly solder the pin onto the pad. There are so many human error when we solder by hand. Even though you think that the pad and the pin is connected, use a microscope or multimeter to see if the connection is there. Sometime when you put too much solder onto a pad, it might causes a short circuit since the solder might be connected to the other pins.

3. Step by step break down the circuit.

Even though the RF part of the circuit cannot be test by oscilloscope since the frequency is too high, but we can test to see if we have the correct power by using the spectrum analyzer. We can test the power of each component and see if our design is working properly. When we try to test our PCB, the performance did not produce a result as in our design. The transmit end only providing about 10 dbm. In our design, we expect to have 18 dbm. So we conclude that one of the amplifier did not solder correctly, and it was correct that the amplifier was not solder properly.

After the RF part of the circuit, we can debug the rest of the circuit by using an oscilloscope since the frequency is much lower. We do the same, we test the output of each components. For example, testing the active fourth order low pass filter. We can test it step by step. We can hook up a function generator to the low pass filter to look at the output of the first amplifier, then the second one, then the third one. Then we know which part of the circuit has problem.

4. Patience

Debugging is a long and tire process. However, it must be done so the design can be finish. Start your design early, do not wait till the last minute to try to finish it. It will not work and it will most likely make you feel tired and frustrated. But if you start early, you will have a lot of time

trying to fix the problem. One of the problem we had this quarter is that we only get 1 PCB chance. We cannot make sure that the PCB will be working the first time we assemble it. We found that some of the PCB connections were wrong. If we have a second chance to rebuild the PCB, we sure that the second one will be in working condition.

The above steps and hints can help you debug your design. Even though they seem like common sense, but to actually implement them are not easy. Not everyone will do the debugging correctly and they would just go find the TA to help them solve the problem. You can find the TA for help in school, but once you start working in a company and doing a project, no one can help you. So please practice self-debugging skills.